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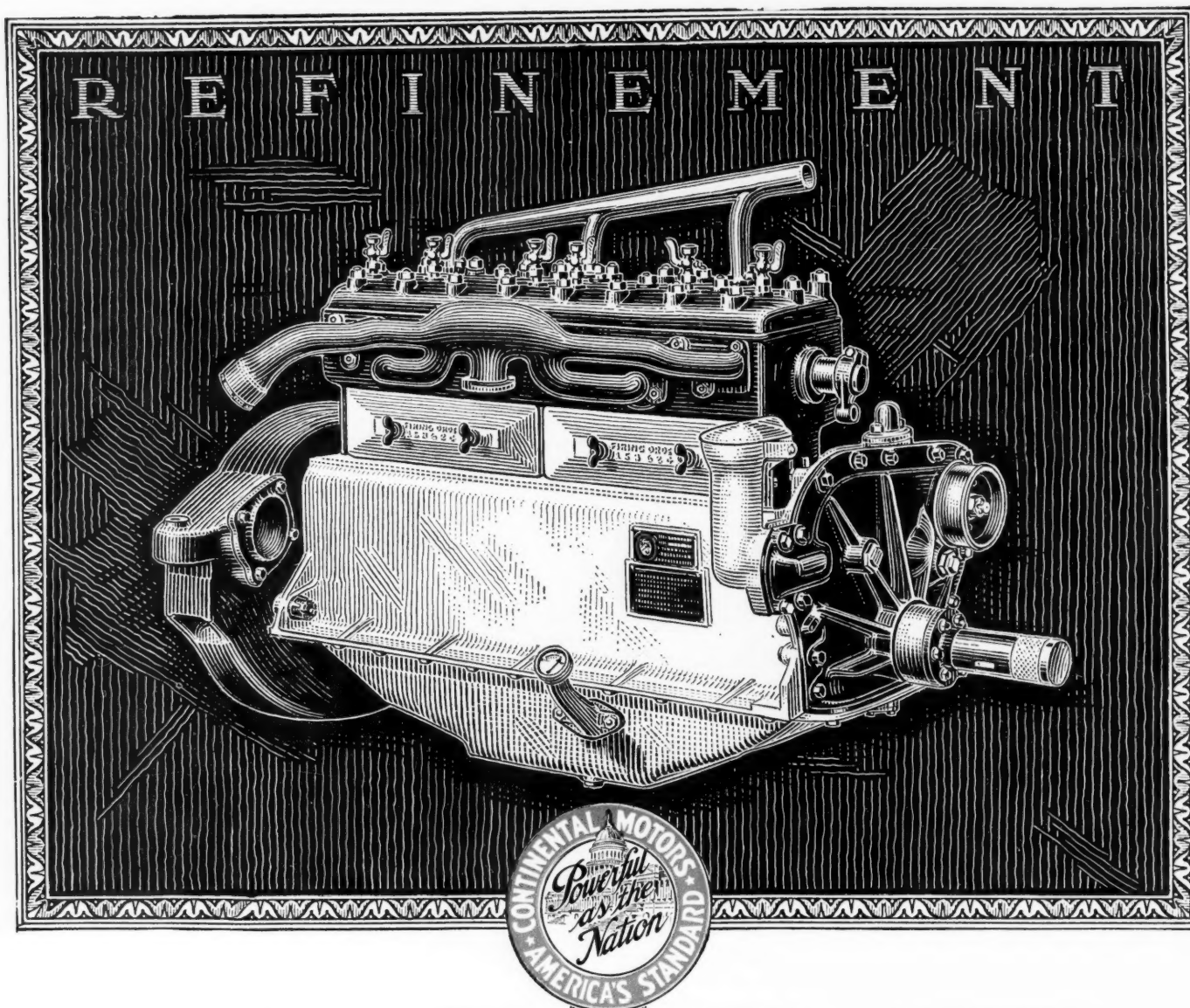
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No. 7

The True Relation Between Wages and Unit Cost

The relation between labor rates, labor earnings; and labor costs is not generally understood. Decreased wages do not necessarily mean decreased unit costs. Here is a timely discussion of a problem vital to the manufacturer at this time.

By Harry Tipper

MUCH discussion has been going on in the papers concerning the so-called liquidation of labor, which is not a liquidation in any sense of the word, but a reduction in the operating cost.

It is evident from these discussions that the relation between labor rates and earnings, with the concomitant relation between labor rates and costs, is not thoroughly understood.

A great many of the discussions have presupposed that a 15 per cent reduction in the rate of labor employed would bring about a similar percentage in the reduction of cost and a similar percentage in the reduction of earnings.

An examination of the best available labor statistics makes it evident that the rise and fall of labor rates does not agree with the fluctuation of labor earnings. Neither labor earnings nor labor rates have had more than temporary reductions in the history of labor since the beginning of the factory system. Although the rates of pay have gone up more rapidly in times of prosperity and remained more stationary in times of depression, they have receded only very rarely and the recession has been comparatively small and very temporary in its character.

During and after the war the labor rates rose very much faster than the average earnings of the

workers in the same trades. Similarly the earnings of the workers in those trades have not decreased in proportion to the rates, since there was a tendency to reduce the rates of pay following the depression. The cost of wages to the manufacturer in the cost of production increased more rapidly during the latter part of the war and afterward, and since the depression began the cost per unit of production has fallen more rapidly than the reduction in the rate. In some of the metal trades factories, for instance, during the rise in wages the rate increased for some occupations to an average of 110 per cent.

At the same time, the efficiency decreased on the average to about 80 per cent, so that the actual cost was increased by considerably more than the rate.

In the period after the peak of industrial prices wages in some factories were reduced 15 per cent and in some others 20 per cent, while the efficiency of the workers increased 24 per cent, bringing the cost of production down much below the actual reduction in the rate of pay.

Curiously enough, however, during the rise, the individual earnings of the workers did not increase as rapidly as the rate and the earnings have not decreased very much since the turn of prices downward.

From the worker's standpoint, his whole position is measured by his earnings over the period. The carpenter who works on an average in the New York district of about 180 days in the year, does not figure that he makes ten dollars a day at that rate, but that he makes so much a week for the year. In fact, he is making about six dollars a day available income. Similarly, the factory worker who moves from job to job from time to time, who makes money at times from overtime and loses it from short time, and so forth, figures that he can depend upon a certain sum per week for his budget, whether he argues it out in this financial fashion or not.

For the manufacturer, of course, the rate of pay is important only where it represents an absolute rate per piece.

In any other situation the rate of pay must be translated into cost per piece before it can be considered in arranging factory costs.

From the beginning of the industrial development, the increased pay of the worker has been met almost every time by an increase in the productivity of the worker, either through the introduction of more skillful equipment or through the better distribution of the labor itself.

We have no evidence from past experience which could lead us to hope that labor would be reduced materially in its price over any considerable length of time. The cost of the labor must be reduced by the increased efficiency and this cannot be done solely through machinery or the better distribution of labor. It must be done through an increase in the human efficiency. Measures that will induce the worker to put out more productive power in proportion to his pay will play an important part in the reduction of labor cost in the period we are now entering.

Most of the labor statistics published are of little value because they record changes in the rates only, changes in the general conditions of employment only. They do not take into account the changes in the cost per unit of production or the average of the worker's earnings. The first is the necessary calculation in considering the manufacturing cost and the second is the important consideration in figuring the relative buying power of the worker.

Merely to say that the buying power will be decreased because the rates of pay are decreased is absurd. The reduction in the average earnings will do that. Merely to say that the factory cost will be reduced because the rates of pay have been reduced is equally absurd.

In some factories where the reduction has been arbitrary and without any apparent reason, the efficiency of the workers has dropped in equal proportions, so that the cost remained about the same. I know one or two cases where the rates of pay were reduced, while the price of the product remained the same, and I know that in one of these cases it was the definite intention of the workers under those conditions to produce less in order to even up for the manufacturer's action. His labor costs were not reduced by the reduction in pay and any fancied advantage he secured was nullified by the action he took.

The usefulness of the general labor statistics, therefore, depends entirely upon the elements entering into them and the way in which they are analyzed in the attempt to secure a knowledge of the tendencies from them.

Analysis of the methods employed by the individual manufacturer will do much to illuminate the problem of lower factory costs per unit of production and will show the very slight relation that exists between the rate of pay and the production costs in various factories employing the same type of labor.

The factors that enter into the labor cost per unit of production include the human factors and their influence upon the fluctuations in efficiency.

The figures alone are indicative only of the general tendencies; they do not illustrate the possibilities. Average figures are only relatively important; they do not aid in the solution of the problem for the individual manufacturer, and no average can be of much service to him in meeting the competition that he must face in his particular field.

There is a tendency for these general statistics to influence the manufacturer in his own actions unduly, either because these statistics appear to justify his own position, or because they suggest a lack of parity between his methods and the general condition.

The variation in the individual problem is the important element in the improvement of labor efficiency and the reduction of the cost of production.

The study of the individual problem is the important study.

Reflex action of the market will show any disadvantage from which the manufacturer may be suffering in his cost per unit.

The only way that his problem can be solved is by the study of his individual case, the elements that enter into it, and the methods that may be applied properly to its improvement.

The general statistics quoted so frequently in present discussions of labor conditions should not be treated too seriously by the manufacturer in estimating the future probability.

There is nothing in past history to indicate that the worker has willingly come back to a less convenient state of living or to lower earnings and nothing has come out of the past which would indicate that rates of pay have materially decreased for any length of time.

Increase in the efficiency of the individual is the only sound basis for the reduction of labor cost and this increase may be produced partly by mechanical arrangements, partly by a better understanding of the human being. In this direction the manufacturer can safely experiment, for every improvement will tend to become permanent.

In the direction of lowering the costs by the reduction of rates, there is not much hope of anything but a temporary alleviation, and this hope may not be realized if the workers do not increase their efficiency comparatively with the rate.

IT is believed that the production of platinum in British Columbia will soon be greatly increased. Investigations conducted during a number of years have disclosed the fact that the Fraser River and adjacent territory constitute one of the principal platinum deposits of the world. A plant is being erected and it is expected that reduction work will be commenced this spring. It is believed that for 250 miles along the Fraser River and 150 miles on tributary streams 75 per cent of the black sand deposits can be dredged and concentrates to the extent of 8 pounds to 40 pounds per cubic yard of dirt obtained.

Design Features Brought Into Relief by Grand Prix

The straight-side cord tire performed specially well in the famous road race this year, while the large number of curves in the course brought the four-wheel brakes into particular prominence. Low weight of American cars created very favorable impression upon European engineers.

By W. F. Bradley

THE recent Grand Prix race marked a revival of long-distance road racing in France, after the disastrous race in July, 1914, when Germany with its six-cylinder aviation engines won first, second and third. This race has re-established with the French populace the value of road racing in the testing of the design of all parts of the car. Murphy's victory averaging 78.1 m.p.h. for 321.78 miles or 15 minutes faster than the Ballot, which finished second, left no ground for disputing the fact that the best car won. This speed, compared with 65.5 m.p.h. in 1914, indicates that advancement has been made during the past 7 years, notwithstanding the fact that the German six-cylinder Mercedes aviation engine, which was victorious in 1914, was well ahead of its time in engineering development.

To-day's race has drawn attention to straight-side cord tires in a way that could not be accomplished in 12 months of ordinary propaganda. It was a distinct victory for this type of tire, notwithstanding the fact that Europe has been opposed to the straight-side construction. The race was a victory for four-wheel brakes in that the 10.7 mile circuit, which was covered thirty times, was full of curves. It was also a victory for light-weight construction in that the Duesenberg cars were the lightest of the thirteen competitors in the race, with the possible exception of a 2-litre Ballot.

A very favorable impression was created by the low weight of the Duesenberg cars, compared with the European machines, and the conclusion was drawn that American metallurgists have got ahead of their European rivals. The following weights, although official, are not entirely accurate, but are valuable from a comparison standpoint. The total weight was obtained by deducting the declared amount of oil, gas and water in the car. As no machine came near the 800 kilos minimum, it was not necessary to empty tanks. Weight on front and rear axles was taken without any serious attempt to ascertain the center of gravity.

| Car | Driver | Front Axle | Rear Axle | Total Weight |
|------------|-----------|------------|-----------|--------------|
| Duesenberg | Murphy | 1052 | 1065 | 2028 |
| " | Guyot | 1053 | 1102 | 2041 |
| " | Boyer | 1049 | 1018 | 2066 |
| " | Dubonnet | 1049 | 1036 | 2015 |
| Ballot | DePalma | 1035 | 1131 | 2072 |
| " | Chassagne | 1042 | 1153 | 2081 |
| " | Wagner | 1023 | 1168 | 2055 |
| " | Goux* | 873 | 952 | 1814 |
| Darracq | Boillot | 1036 | 1102 | 2132 |
| " | Thomas | 1047 | 1223 | 2052 |
| Talbot | Guinness | 1078 | 1289 | 2191 |
| " | Segrave | 1113 | 1228 | 2189 |

*2 litre car. All other cars had 3-litre engines.

In all cases the tanks contained very little fuel. It will be noticed that the Duesenbergs were more heavily loaded on the front axle than any of the others, this being due to their unit construction of engine and gearbox, compared with separate construction on a 3-point suspended sub-frame for Ballot, Talbot and Darracq.

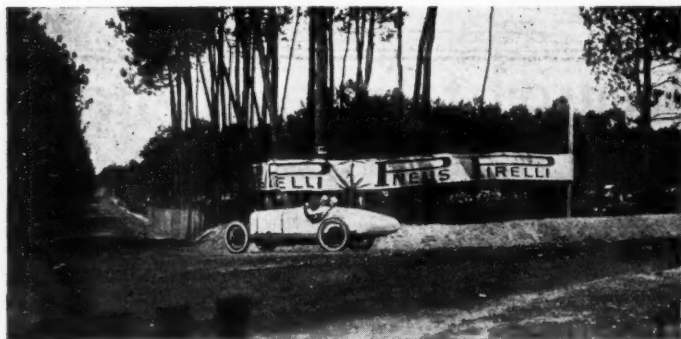
There is reason to believe that the lightest engines were the Talbot and the Darracqs, yet these cars were the heaviest of the group. In the frame members alone there was very much more weight than in the Duesenberg frames and less strength. The rear axle, too, was considerably heavier, and the very fine work done in the engine had not been carried out in all the details of the chassis, with the result that total weight was unnecessarily high.

Definite information regarding power output naturally was not given out. There is reason to believe that the Talbots and Darracqs got the highest power on the bench, but they did not have the same economical utilization of this power as their rivals. Duesenberg states that he reached the peak at 4200 r.p.m., which is the same figure as for Talbot-Darracq. For the Ballots the peak was 3600 r.p.m. For a course of this nature a four-speed gearbox would have been an advantage, but its absence did not prevent Duesenberg winning. As an offset, of course, he had low weight and the ability to run the engine at very high speeds for short periods.

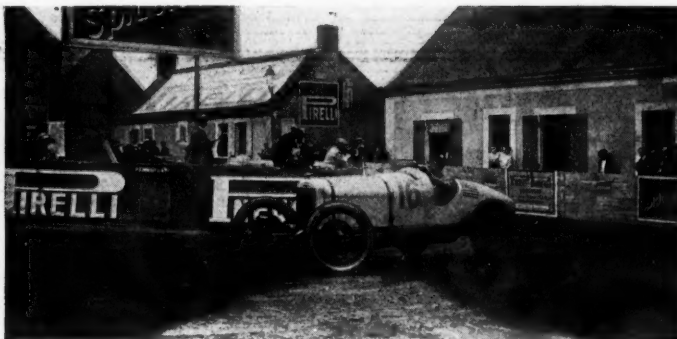
Ignition Performance

Ignition honors were equally divided. Delco equipped Duesenberg, Talbot and Darracq, and the Swiss Scintilla magneto was used on the Ballot cars. There were no ignition troubles, and plugs, which were K.L.G.'s for the Europeans and A.C.'s for the Americans, were equally satisfactory.

After arrival in France three of the Duesenberg cars were equipped with the French Claudel carbureter. Murphy decided to retain his Miller, which he had got into first-class condition, for although the Claudel seemed to be rather better on acceleration, he was not disposed to take the risk of a road accident during a final test on the day before the race. The trouble with the Claudels was sticking throttle barrels, occasioned by road dust. Chassagne foresaw this and fitted a very heavy recall spring. Wagner and De Palma had to fit extra springs during the race. This was not the fault of the drivers so much as of the firm, for Ballot did not encourage suggestions from his drivers, and Chassagne was in a position to get work done which could not be attempted by the others.



One of the right angle turns



A hair pin turn

All cars in the race used four-wheel brakes. The Duesenbergs were of the hydraulic type and proved exceedingly efficient. For the road it was decided to inclose the drums and the operating mechanism, this being essential on a highway, although not necessary on the track. With the exception of Ralph De Palma's car, the Ballots were fitted with a service brake designed by Engineer Henry. It made the work of the driver lighter and proved very satisfactory in the race. Ballot had smaller drums on the front than on the rear. After road tests the Duesenberg crew realized there was an advantage in this and got the same result by cutting away a portion of the brake shoes. The Talbots and Darracqs had equal braking surface front and rear. Metal brake linings were used on all cars. The only use of fabric lining was for the Ballot clutches. Duesenberg led the field in the matter of stream lining. The shape of the body, the colors, the position of the drivers and the tone of the exhaust, all tended to exaggerate the impression of speed conveyed by the American cars, compared with their European rivals. Some of this, of course, was accidental, but the general impression was excellent.

Tires

Tires played a very important part in the race which was started at one minute intervals, and in pairs. The Oldfield cords used on the Duesenbergs proved to be not quite suitable for stony French roads. No rain had fallen in this part of France for three months and the neighborhood being naturally sandy, all the road dressing disappeared after an hour's running, leaving certain portions of the course thickly strewn with stones. These were very destructive to the Oldfield cords produced under Indianapolis track conditions.

The Italian Pirelli company had brought out a new straight side cord tire of 35 by 5, which was supplied exclusively to the Ballot team. This proved to be a good tire for these conditions, for when Chassagne went out after 17 laps his tires were in first class condition, and Ralph De Palma covered the entire distance without making a change. The American driver imitated the Duesenberg team by going away without a spare wheel. The Frenchmen refused to do this. Experiments had shown that it was quicker to drive on the rim, even if the burst took place just after the pits, than to change on the roadside and then stop again to pick up a spare wheel. This was the first time cars had raced in France without carrying a spare wheel.

Dunlop also produced a new straight side cord which was supplied to the two Talbot and the two Darracq cars. This tire gave such poor service that Oldfield straight side cords and Michelin clincher bead cords had to be used. While it is extremely doubtful if they could have won the race, the Talbots and the Darracqs

certainly would have finished in much better position had their tires been equal to the Pirellis. These cars started out with the new Dunlop cord straight side but some of these only stood up for two laps, and before the end of the race the cars were running on a combination of Dunlop and Oldfield straight sides and Michelin clincher bead cord.

The French motoring public attaches an immense amount of importance to the lessons learned in racing, and the theorist who now comes forth to prove the detrimental influence of circumferential weight will find it hard to get attention. There are no signs that anybody is preparing to profit by this demonstration, but the fact remains that this race has made the way easier for the introduction of the straight side by dissipating many of the prejudices which existed against it.

The French cars had decidedly better tires for this class of road and were handicapped over such a comparatively short distance as 322 miles.

American prestige has been enormously enhanced by Duesenberg's victory in France. The win was so fair, there was such an absence of the element of chance, that all open-minded spectators admit the best car won. Boyer's Duesenberg went out with a broken rod, but Chassagne's Ballot was eliminated with a broken axle. Jimmie Murphy was overheating when he finished, but this was due to a leaky radiator punctured by a flying stone. Guyot's Duesenberg had clutch trouble, but so had Wagner's Ballot.

Race Preliminaries

Murphy got into his Duesenberg still suffering from his accident of a week before, when, owing to the seizure of the brakes, he overturned in the ditch. He was carrying Louis Inghibert, who had been scheduled to drive No. 4 Duesenberg. Both men were pinned under the car. Inghibert was taken to the hospital with four broken ribs, but although the French doctors declared that Murphy had no fractures, he suffered so much that he believed one rib had been broken. Nevertheless he started in the race well bandaged.

All the competition lay between the Duesenberg and the Ballot teams. In addition to these two a couple of Talbots and two French Darracq cars had been entered, also a Mathis of only 1500 cubic centimetres, or half the piston displacement allowed under the rules. The Talbots and the Darracqs were in an unprepared condition and had been re-entered twenty-four hours before the start, after having been withdrawn. The Mathis had been delayed by strikes and in addition was incapable of winning by reason of its small piston displacement.

Louis Wagner burned the fabric lining of the Ballot clutch on the initial lap and after losing a quarter of an hour in making repairs and being further delayed

by sticking throttles, he did not figure as a serious contender.

Ralph de Palma, looked upon by the public as the fastest of the Ballot quartet, did not seem to have all the speed that was expected of him, and admitted after the race that his car was five miles an hour slower than when he drove it in America. He also was delayed by sticking throttle barrels. This defect was overcome by fitting extra springs, but not until a certain amount of time had been lost on the turns.

De Palma and Joe Boyer tied for first place on the initial lap, the time being 8 min. 16 sec. for the 10.7 miles of the course. Chassagne and Murphy tied for second place in 8 min. 21 sec., and Guinness and Andre Boillot tied for fourth place in 8 min. 39 sec. Thomas, on the Darracq, had mechanical troubles on the first lap.

Murphy and Boyer in Duesenbergs tied for first place on the second lap, making the two circuits in 16 min. and 13 sec., with Chassagne and DePalma following in the Ballots.

After a couple of laps Jean Chassagne on Ballot proved that he was the fastest of the Frenchmen. He handled his Ballot in a wonderfully clever manner and after trailing Murphy and Boyer for six laps he got ahead of the Detroider in the seventh and took the lead on the twelfth lap after Murphy had stopped for two rear tires and gas. The Frenchman held the leading position for the next six laps, but could not shake off either Murphy or Boyer and began to be threatened by Albert Guyot, who, after an indifferent start, began to climb rapidly.

The height of excitement was reached at this point, for it was evident that all the French hopes rested on



Tommy Murphy in his winning Duesenberg

Chassagne. De Palma had never been able to get better than fourth, Goux was handicapped by having a car with a piston displacement of only 2 litres, and Wagner had a lot of time to make up by reason of his clutch trouble at the start. While Boyer and Murphy were chasing Chassagne hard, the difference between the blue French and the white American cars always being less than a minute, Chassagne pulled into the pits with gasoline streaming from his tank, caused by the breaking of the rear axle when the Ballot skidded on one of the turns in an effort to avoid Dubonnet's Duesenberg. The fractured axle struck the gas tank. This accident was similar to the one which befell Thomas when driving in the Targa Florio race.

With Chassagne out Jimmie Murphy had the race in his hands and was never headed until he crossed the line a winner.

British Discuss Overseas Motor Car Trade

AN overseas automotive trade conference, promoted by a monthly automobile export paper, was held recently in London. The Government was represented by the new Minister of Overseas Trade who, while deploring the failure to stem the flood of imported automobiles despite the tariff of 33⅓ per cent on cars, had to explain the decision of the Government to cut down his own department to fit in with the country's present reduced spending capacity.

This Minister, however, was constructive and useful in suggesting the manufacture of a purely utility form of car for the Dominions.

The chairman of a truck company and a notable office bearer in the British trade's council indorsed the appeal to his fellow manufacturers to combine to produce the required car and urged that the overseas market could not be recovered unless wages were reduced and production increased. Ford has proved that there is a relation as of cause and effect between high wages and big output provided that the business is handled rightly and that those at the top of the enterprise concerned will reverse the British way of looking at things, namely, produce to create a demand, and not wait for the demand before starting to produce. This speaker, being a strong tariff man, deplored the Australian Government's recent decision to cut down the British preferential tariff to 5 per cent. Why not meet the situation with a combination of British automobile capital and set up a factory in the Dominions the same as other British industries have done recently, sending out their own picked staffs to develop the business?

Major Goddard, editor of the trade monthly which promoted the meeting, threw out several suggestions to the overseas visitors. In effect he asked the visitors to state "whether it was practicable to produce a type of car at a proper price for overseas trade; how best to push British cars and whether standardized component parts from which overseas traders could build their own cars would be of value?" Major Goddard, as might be expected from this quest for information, holds that the British automobile makers have failed in propaganda.

The visitor spokesmen told a few home truths to the effect that American cars are not the "duds" in the Dominions which interested parties would have us believe; that they wear reasonably well, and can be sold at the right price and that the business is effectively handled.

Ultimately it was resolved to convene a conference of overseas delegates to consider, first, problems of gearing; second, of adequate cooling, and, thirdly, of screening and hoods, as in these matters it was unanimously agreed by the overseas delegates that the American car was superior to the British.

THE Stahlwerke Lindenberg A. G. of Germany have patented a new tool steel which, despite its relative softness, is claimed to allow of high cutting speed, to produce a smoother surface, to have a higher elastic limit and to require less lubrication than standard tool steels. These favorable properties are obtained by the addition of small quantities of refining metals, such as 0.3 to 1 per cent of chromium.

Technical Features of New Durant Car

This new car, built along conventional lines, is likely to be a big commercial factor in the low-priced market. The engine is an overhead valve type, and the cylinders and top half of crankcase are in a single casting. Muffler construction adds materially to stiffness of the frame.

By P. M. Heldt

THE new car of the Durant Motors Corp., which is being assembled at the former service station of the Ford Motor Co. in Long Island City, owes its importance mainly to Mr. Durant's standing in the industry. It will be turned out in large numbers and will undoubtedly be a big factor in the low priced market during the next few years.

The design throughout is along conventional lines for cars of the price class to which this model belongs, but the chassis is exceptionally "clean." The engine, which has cylinder dimensions of $3\frac{7}{8} \times 4\frac{1}{4}$ in., corresponding to a piston displacement of a trifle over 200 cu. in., is of the overhead valve type. Cylinders and top half of crankcase are in a single casting, but the cylinder head is cast separately, so the valves can have their seats directly on water-cooled surfaces. The valves are located in a line extending the length of the engine and are operated through tappet levers in the usual way. The arms of the levers are of unequal length so as to give a slightly greater lift to the valves than the stroke of the tappet rods.

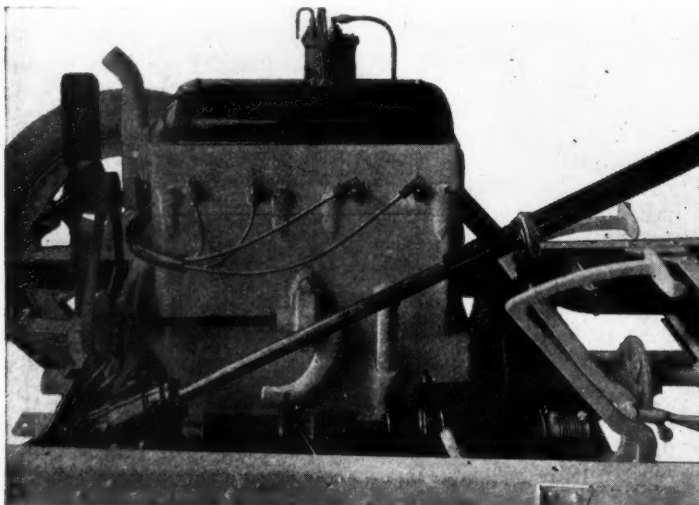
The waterjackets extend all the way down the cylinder barrels, and there is no offset in the casting at the lower end of the piston stroke. The tappet rods extending down the right hand side of the cylinder block are enclosed by a sheet metal cover, and there is another cover of pressed steel over the tappet levers and other mechanism on top of the engine. The latter cover is supported by means of risers cast on the cylinder head which also carry the shaft forming the pivot for the tappet levers. The cylinder head is held to the cylinder block by eight studs, of which the four on one side also hold in place the caps over the tappet lever pivot shaft. With valves in the head, the head cast-

ing is naturally much stiffer than one for an L-head engine, and a smaller number of bolts suffice to secure a gas-tight joint and hold the gasket securely.

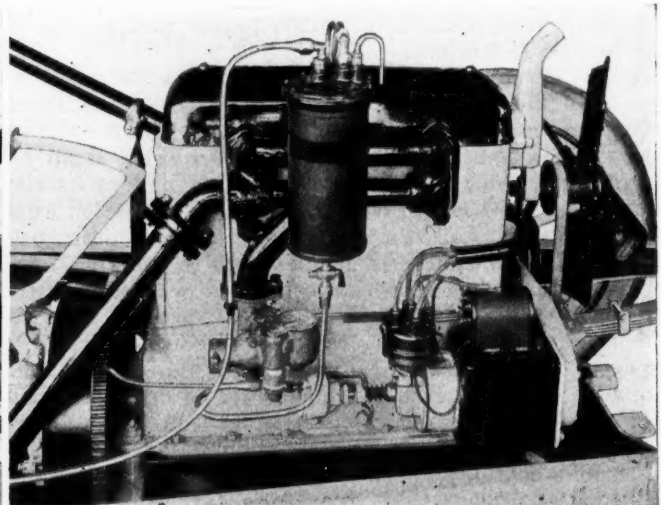
The pistons are iron castings with three rings above the piston pin. The piston pin is clamped tight in the connecting rod and its ends bear directly on the cast iron of the piston bosses. There is nothing out of the ordinary in the design of the connecting rods, which are I-section drop forgings and have their caps held on by two bolts each, duly secured by cotter pins. Piston and connecting rod together can be removed through the bottom of the engine after the oil pan is taken off. The crankshaft has three main bearings and is of light design. The caps under the two end bearings are cast with segmental flanges with which the crankcase bottom half makes an oil-tight joint. This bottom half is a steel drawing and has the splash troughs riveted in it. The engine has a four-point support on cross members of the frame. Camshaft drive is through helical gears at the forward end, the housing being closed by a sheet metal cover.

Fuel is carried in a 13.5 gallon tank mounted at the rear of the frame, from which it is fed to the carburetor by a Stewart vacuum feed tank which is supported alongside the engine. The make of the carburetor has not been finally decided upon, but the car from which these notes were taken was fitted with a Tillotson. A rather novel combination inlet and exhaust manifold is used, the shape of which is clearly shown by the sketch herewith. The carburetor is located toward the rear of the engine on the right hand side.

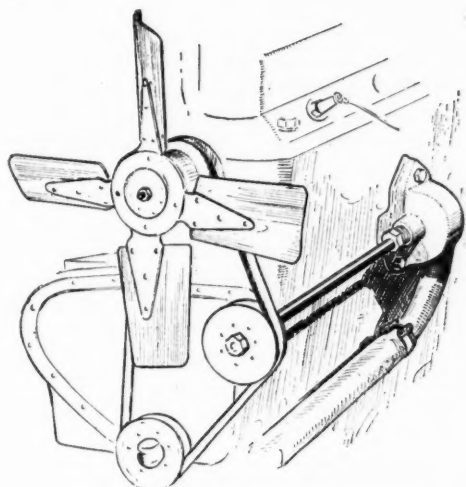
The electrical equipment is of Autolite make. The starter is located on the left hand side and drives to a gear



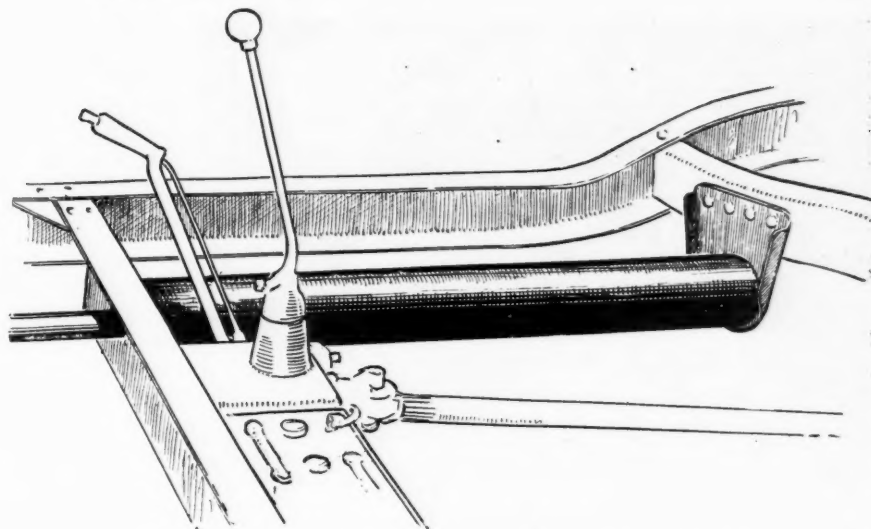
Left side of engine, showing mounting of steering post, starter and horn



Right side of engine, showing manifold and mounting of vacuum tank



Triangular drive of pump and fan



Muffler mounted so as to reinforce frame against weaving

ring cut on the flywheel through an inboard Bendix drive. It may here be pointed out that the gearcase is a separate unit and the flywheel, starter and drive are uncovered, so that both the starter and its driving mechanism are in plain view on the chassis and very accessible. The generator is mounted on the opposite side of the engine, forward, and is driven from the camshaft through enclosed gearing. The same as the starter, the generator has a square sectioned field frame, and on top of it is mounted the ignition coil. The timer-distributor is also mounted on the generator, being arranged vertically in the usual manner. The high tension cables from it to the spark plugs are carried through a metal tube around the forward end of the cylinder block. All other wiring is encased in flexible metallic tubing.

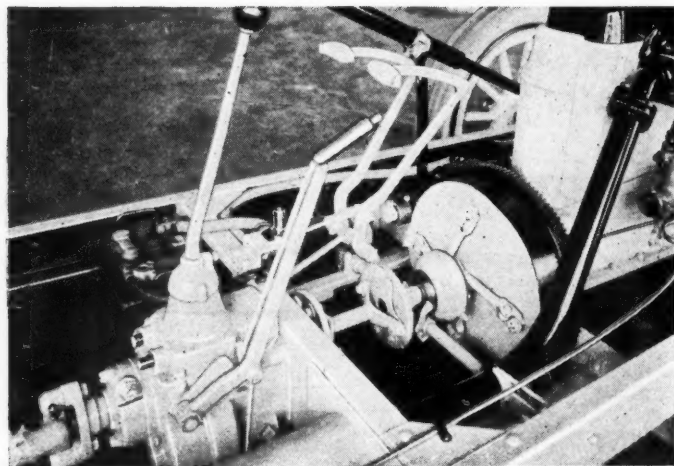
Lubrication is by the circulating splash system, a gear type of pump being carried on the outside of the crankcase on the right hand side and driven from the generator through a flexible coupling. Oil is fed to the main crankshaft and to the camshaft bearings directly, and a pressure gage is mounted on the instrument board to indicate the pressure at which oil is delivered to these bearings. Oil is also delivered into each of the four splash troughs and into the cam gear housing, and splash within the case provides lubricant to all the other bearing surfaces. The oil pump draws its oil from a large strainer at the lowest part of the oil pan. There is a combined breather and oil filler on the right hand side of the crankcase near the rear, which is carried up sufficiently high to make it easy to renew the oil supply. The oil passages to bearings are drilled and there is no outside piping.

Cooling is by pump circulation. A centrifugal type of pump is mounted on the right hand side and is driven by a Vee belt from the forward end of the crankshaft. The same belt drives the four-bladed radiator fan, the drive being a triangular one, with one side substantially vertical. There is one peculiarity to the water pump, and that is that its impeller is located partly within the engine water jacket and its housing is of substantially semi-cylindrical form. This brings the pump drive shaft very close to the cylinder block and ensures free circulation of the water by thermo-siphon action in case of failure of the pump or its drive. As a means for adjusting the tension of the drive belt, the base of the fan bracket is provided with elongated holes by which it is bolted to the cylinder block. The hub of the fan contains an oil reservoir from which its bearings are lubricated. The radiator is of standard form and has a cap covered with a molded heat-insulating composition.

The muffler, which is located just inside the right hand frame side bar, between a cross member directly in front of the gearset and another substantially over the rear axle, serves the additional purpose of stiffening the frame against weaving. The frame is made up of 4½ in. channel sections with few cross members, of which two at least are quite flat, so that as a whole it is very flexible. The muffler, however, being a long tube of about 6 in. diameter and relatively heavy walls, and securely fastened to the cross members by means of flanges at both ends, adds greatly to the stiffness of the frame. The muffling elements are of the simplest possible nature. The exhaust pipe enters the muffler centrally at one end and is carried part-way through it. Its end is closed up but that part of the pipe within the muffler is perforated and the exhaust gas escapes through these perforations into the muffler, from which it passes to the atmosphere through an opening on the lower side of the rear end, formed by a bulge in the head.

The clutch is built together with the flywheel and is of the single plate type. The steel driven plate is slotted radially so as to prevent distortion through heating, and consequent trouble. On both sides of the steel driven disk there are floating disks of wire asbestos 11½ in. in diameter and on the outside of these floating disks are the flywheel web and a plate which is in direct driving connection with the flywheel. The disks are pressed together by a series of coiled springs located near the periphery, while the disengaging pressure is transmitted through a series of four levers, which, instead of being arranged radially to the clutch axis, are offset from that axis to such an extent that they pass the clutch shaft, which permits of a greater multiplication of the pressure. Except for the disengaging pressure multiplying levers, the clutch is completely enclosed. There is a large oil chamber in the shifting collar, and lubrication of the clutch bearing needs to be attended to only once a year.

Between the clutch and the gearset there is a short intermediate shaft with two fabric universal joints, the spiders of which have two arms each. The gearset is supported on a cross member of the frame. It is of the ordinary three speed and reverse, selective sliding type and is fitted with annular ball bearings on its primary shaft. The shifting lever is of the ball-mounted, ball-handled type and is centrally located. Gear positions are arranged in accordance with S. A. E. recommended practice. The emergency brake lever is mounted on the right side of the gearbox and operates on a toothed sector as usual. Cast iron is the material of the gearcase. The latter is of the



Central part of chassis

functional form, the walls coming close to the contained parts at all points, and is therefore exceedingly compact. The speedometer drive is taken from the rear end of the gearset.

Between the gearset and the rear axle is inserted the solid propeller shaft with two metal type universal joints. The final drive is by spiral bevel gears and gives a reduction ratio of $4\frac{1}{3}$ to 1. Ring gear and pinion are of chrome nickel steel, the former being fastened to the flange on the differential by riveting. The rear axle is of the built-up, three-quarter-floating type. At the differential there are annular ball bearings and at the wheels Timken roller bearings. The differential is of the two-pinion type. As usual with the built-up housing, the axle carries an under-running truss.

The frame, as already mentioned, consists of $4\frac{1}{2}$ in. channel bars, and these are straight from end to end in the vertical plane, but are set considerably farther apart at the rear than at the front. The frame is supported by half-elliptic springs all around, the rear springs being 48 in. long and the front springs 34, and both sets 2 in. wide. The rear springs are underslung. The Alemite lubricating system is used for the whole of the chassis. All shackle bolts are hardened and ground. Torque reaction and driving thrust are taken care of by a Hotchkiss drive.

In connection with the frame, mention should be made of the method of supporting the storage battery. The latter is located alongside of the gearset. A shelf in the form of a steel plate is riveted to the underside of a frame cross member on which the battery is set. A steel band passes horizontally around the battery at about mid-height, its ends being provided with pull-up screws which extend through the web of the cross member and are drawn up by nuts, thus holding the battery firmly in position.

The front axle is of the regular I-beam type, but the steering knuckles are of the inverted Elliot type which is found more frequently in cars of the higher priced class. Stops are forged on the knuckles to limit the steering deflection and prevent contact between the tires and parts of the chassis. The tie rod is located to the rear of the axle in a protected position. The drag link extends crosswise of the chassis and connects to a separate ball stud. Two Timken roller bearings are fitted in each front wheel. A feature of apparently considerable importance from the driver's point of view is that each wheel hub is formed with an extension in which a central screw thread is tapped, so that by carrying along a bolt of quite moderate dimensions the driver always has a wheel puller with him.

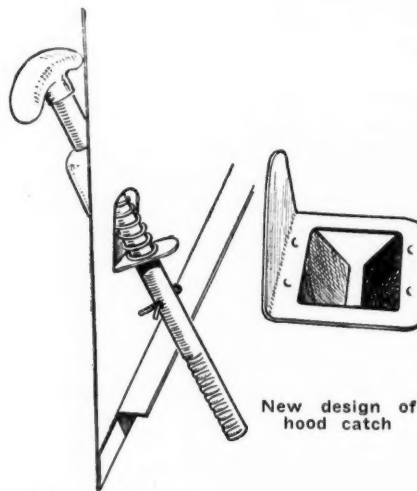
The steering gear is of the worm and complete wheel type and the post is strongly raked. The steering gear housing is located between the engine crankcase and the

frame directly to the rear of the frame cross member supporting the front end of the engine. Back of the steering gear housing is located the vibrator type of electric horn and back of this the starter. Beneath these parts there is a sheet steel filler plate extending between the engine and the frame. These accessories all lie quite low down, and the sides of the engine higher up are encumbered very little.

The steering wheel is 16 in. in diameter and has a walnut rim and an aluminum center. The inner ends of the spokes show as aluminum and the outer ends as wood, giving an attractive appearance. Spark and throttle controls are of the aluminum die-cast type, held in position by friction, and are mounted centrally on the steering post. The horn button is also located on top of the steering post. From the lower end of the steering post the connections to the carburetor and ignition unit are by flexible steel wires extending through tubes with their ends fixed, after the manner of Bowden wire controls.

Both sets of brakes act on drums on the rear wheels. The outside brakes are the service brakes and the inside the emergency. The brake drums are 12 in. in diameter; the inside bands are $1\frac{3}{4}$ in. wide and the outside 2 in. Each set is provided with means of adjustment adjacent to the drum which can be operated without the use of tools. The cross shaft for the brake linkage is located in front of the gearset, being supported by the same frame cross member which carries the transmission and storage battery. For supporting the clutch and service brake pedals there is a small sub frame, that is, a pair of short channel section frame members extending longitudinally.

A somewhat novel form of hood catch is used. This consists of a T-fitting, the shank of which extends through an

New design of
hood catch

opening in the hood, and is provided at its lower end with saw tooth slots on opposite sides, while the spaces in between are left smooth. Secured to the frame side members are catches of hardened steel which engage into the slots on the shank of the T-fittings when the catch is locked. When the driver wants to open the catch he slightly

presses down on the T-fittings and then turns them around their axis through a quarter circle, whereupon they may be pulled out. The sketch herewith illustrates the idea fully.

The construction throughout is quite light and the five-passenger touring car, we are informed, weighs only 2300 lbs. The bodies are upholstered in leather and the tops are made of a leather substitute and provided with a glass window in the back. The cars which the writer inspected at the Long Island plant had a well balanced and well finished appearance. Tire equipment is 34 x 4 in. Goodyear on wood wheels with steel felloes. A very rigid tire carrier is mounted at the rear of the body. The equipment includes drum shaped headlights with non-glare lenses; dash light, tail light and license holder on rear tire carrier, electric horn, speedometer, demountable rims with extra rim, ignition lock, robe rail, Alemite pump and a set of tools.

New Model Light Cars Planned by British Makers

The success of the low powered, light weight car Rover is causing well known firms to enter this competition. Exhibitors at last Olympia show express dissatisfaction with the two building arrangement and some threaten to withdraw.

By M. W. Bourdon

IF present plans mature, the next Olympia show will see several firms well known in the world motor industry showing supplementary models which will be striking departures from their present output.

Rolls Royce, for example, has a 20 hp. six-cylinder on the stocks, but no details are yet available;

Daimler is planning a 12 hp. four-cylinder at a popular price;

A company associated with the Daimler, the Birmingham Small Arms Company (B. S. A.) now selling motor cycles only on the automobile side, has taken up a two-cylinder air-cooled Vee engine which Hotchkiss has been testing out and will make a runabout to compete with the highly popular 8 hp. Rover and cut across the elaborate motor cycle and side-car outfits in price and performance.

Armstrong-Siddeley has a 10 hp. water-cooled light car in prospect;

Singers, who have bought up the Coventry Premier, are making a four-wheeler under the last name also to compete with the little Rover.

The success of the Rover, both from the practical and the sales standpoints, will, in fact, result in its having several serious competitors next year with the reputations of well-established firms behind them, while the existing light car makers will also find competition increased by additions to their numbers.

The Star Co., for instance, has recently announced a new model of this type with a four-cylinder engine 69 x 120 mm. (2¾ in. x 4¾ in.) for two and four-seated bodywork and selling at £495 and £545 respectively (say \$2500 and \$2750 at normal rate of exchange.)

London Show Space

AS a result of the dissatisfaction which was loudly expressed by those exhibitors at the 1920 London Show, who were relegated to the White City buildings instead of being accommodated at Olympia, a deputation waited upon the Council of the Society of Motor Manufacturers with a protest concerning the method in which the ballot for positions has in the past been conducted. They wanted all exhibitors to be given equal chances of getting into Olympia or else an assurance that some at least of the most widely known firms should accompany them to White City.

It has been felt that the public looked upon the White City section as a "side show" where only new and unimportant firms were to be found, and as stated in AUTOMOTIVE INDUSTRIES at the time of the last show, this was undoubtedly the view taken by a large proportion of the public. The majority of American cars were at White City, though there were many at Olympia

as well; the former were mostly newcomers to the British market and they certainly were not exhibited to the best advantage in being unable to have space at Olympia.

But the S. M. M. T. has decided that existing ballot arrangements must hold, despite the threat of complete abstention from the show on the part of the deputies and those they represented failing acquiescence with their request. To enable the matter to be further considered by the dissatisfied firms it was decided by the Council to postpone for a week the closing date for applications for space. Incidentally it was mentioned to the deputation that the attendance last year at White City was approximately 70 per cent of that at Olympia, but if the writer's opinion is justified it was the other 30 per cent that included the majority of potential buyers; they went to Olympia first, from habit if not through ignorance of the existence of the other section and Olympia got most of their orders.

This division of the show is a very poor makeshift for a one-building exhibition, and there is an increasing demand for a complete withdrawal from Olympia and a concentration at White City; the latter would accommodate all comers. But the S. M. M. T. Council consists mainly of representatives of firms entitled to participate in the initial ballots for space and naturally they are not keen to give up the advantage they hold under the existing arrangements.

Motor Tractors in French Railway Service

EXTENSIVE use of motor tractors in the distribution of freight is being made by the Orleans railroad in France. Tractors of 3100 lb. weight are used, which are strongly built only in the frame, but as regards the engine power are about equal to ordinary passenger cars. The tractors are fitted in front with single and in the rear with dual pneumatic tires, and carry over the rear axle a vertical screw spindle which serves to press down the tongue of the trailer, so that part of the trailer load can be transferred to the axle of the tractor. This makes it possible to haul with so light a tractor trailers which carry up to 8 tons useful load. The trailers themselves run on solid rubber tires. Originally the railroad provided two trailers for each tractor, while in addition one tractor served for switching purposes in the yard. Later the number of trailers was increased to three. According to the experience so far had, one driver can make four trips daily with 18 to 20 tons of freight and a mileage of 28, which is equivalent to the work of two teams. The company plans to install a total of 20 tractors and 50 trailers at the Ivry Depot in Paris.

A New Block-Cast Six-Cylinder Engine

Overhead valves are operated by rocker arms and push rods from camshaft in crankcase. Constant clearance aluminum pistons employed. Engine is characterized by unusually neat external appearance. Weight is 600 lbs.

By J. Edward Schipper

THE Rochester engine is an interesting combination of racing and commercial practice. It differs materially from the Rochester-Duesenberg four, described in *AUTOMOTIVE INDUSTRIES* for March 4, 1920. An overhead valve with overhead rocker arm action is used in place of the long side rocker arm employed for the racing engine and the four-cylinder type previously described.

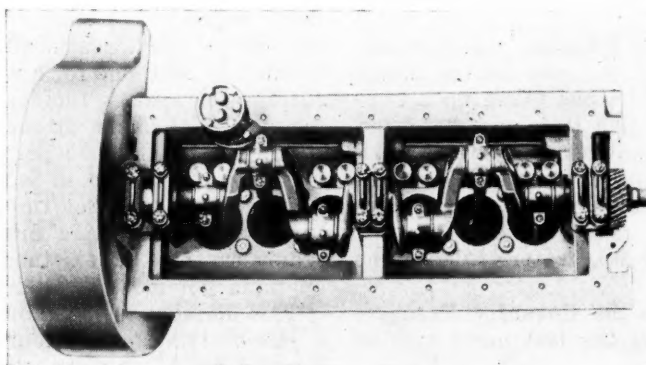
The Rochester six-cylinder engine employs two valves per cylinder. It is a block-cast unit with detachable head in which the valves are carried. The crankcase is of conventional type, the upper half carrying the main bearings. Aviation practice has been followed in one particular for the main bearing studs run completely through the case and hold down the cylinders.

The cylinders have a 3.6 in. bore and the stroke is 5 in. A maximum of 80 b.h.p. is developed at 2600 r.p.m. The cylinder casting is of semi-steel and is noteworthy for its clean exterior. On the right side of the block there is nothing except the water outlet and the valve adjustment cover plate. To the left side of the engine are bolted

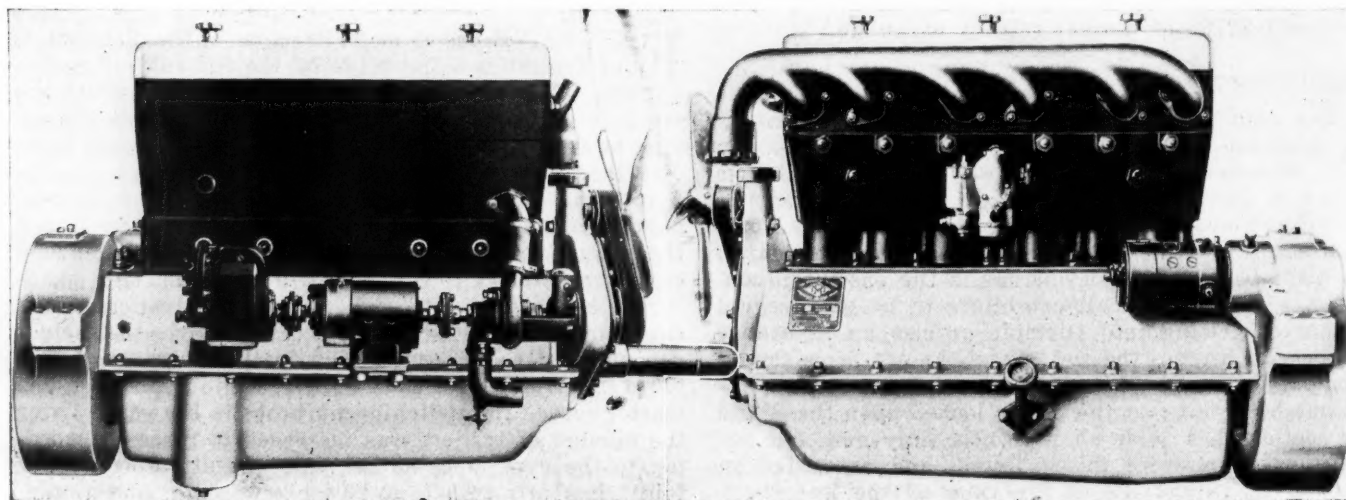
the exhaust manifold and the carbureter, which latter is of a horizontal type, the intake manifold being integral with the cast iron cylinder head.

The pistons are aluminum alloy of the constant clearance type. In this piston, the head is partly separated from the skirt by means of a slot which compensates for the normal expansion of the metal. The pistons are of the flat head type and are equipped with three rings all above the piston pin. The piston pin is of seamless steel tubing, hardened and ground. The pin floats in the piston, and is clamped in the end of the connecting rod. The piston assembly weighs 1 lb. 4 oz. The clearance of the piston skirt is 0.004 in. and the clearance over the ends of the piston pin is 0.025 in.

The connecting rods are I-beam section and weigh 3 lb. The lower rod bearing is a bronze backed, babbitt lined type, the cap being retained by two nickel steel bolts. The crankshaft is a three-bearing type, drop forged from 40-50 point carbon steel. The shaft is of the inherently balanced type with bow shaped throws. The main bearings are babbitt



View of Rochester engine with bottom pan removed showing crankcase and crankshaft bearings

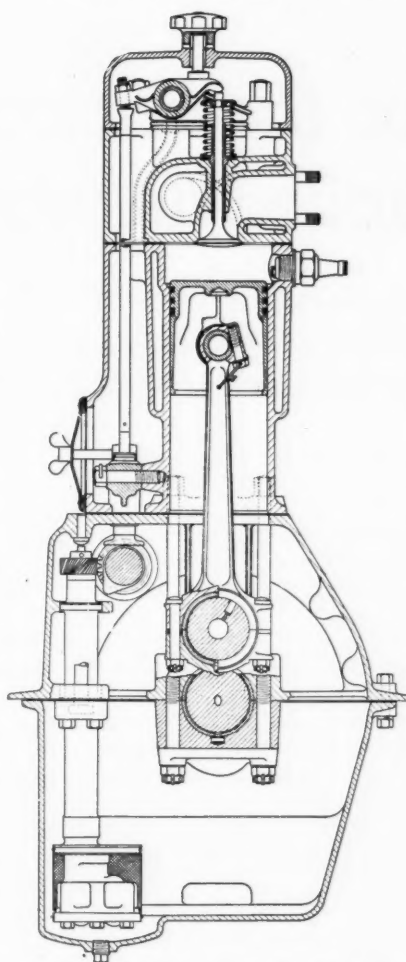


Right side of Rochester, six-cylinder, block-cast engine showing water pump, generator and magneto drive

Left side of Rochester engine showing exhaust manifold which has its outlet forward. The intake manifold is integral with cylinder head

lined and bronze backed. The bearing sizes are $2\frac{1}{4}$ in. diameter throughout, the lengths being 2.5 in. for the front and center bearings and 3.5 in. for the rear bearing. The flywheel is a steel forging.

The valve actuating mechanism consists of a train of three gears, these being connected with the crankshaft, water pump and camshaft respectively. The camshaft and water pump drive gears are of 40-50 point carbon steel, whereas the camshaft gear is of Bakelite. These are helical gears and they are housed in the usual manner in the front end of the crankcase. The three-bearing camshaft is located within the crankcase. Besides the integral cams it carries a helical gear for the oil pump. The camshaft is pack-hardened and ground. The cam followers are of 35-45 point carbon steel, of the mushroom type, operating in cast iron guides bolted to the cylinder blocks and detachable in groups of six. The push rods are of seamless steel tubing, with ball and socket ends. The upper end of the push rod is socketed to receive the ball on the end of the rocker arm. The rocker arms are also of 40-50 point carbon steel, with a hardened button which bears on the end of the valve stem. The other end of the rocker arm is drilled and fitted with an adjustable tappet bolt, the lower end of which rides in the push rod socket, as described. This tappet bolt is secured in position by a lock nut, and movement of the bolt provides adjustment on the valve drive. The rocker shaft bearings are bronze bushed, the shaft being of steel tubing secured in three brackets in the cylinder head.



Transverse section through
Rochester six-cylinder
valve engine

The valves are of $1\frac{9}{16}$ in. clear diameter with $\frac{3}{8}$ in. lift. The inlet valves are of nickel steel and the exhaust valves of tungsten steel. There are two coil springs to each valve. Over the valve mechanism is an aluminum alloy cover bolted to the cylinder head with three center studs.

Lubrication of the engine is by a full force speed system. The oil is pumped by a gear driven pump operated from the camshaft by helical gears. The entire pump can be removed as a unit from the base of the engine for cleaning. Oil is forced to the main bearings and connecting rod bearings, as well as to the camshaft and rocker arms. Overflow from a relief valve lubricates the water pump shaft and timing gears. The pistons, piston pins and cam followers are oiled by spray.

Water circulation is effected by a gear driven, centrifugal water pump. The fan pulley is located on the forward end of the pump shaft, which also takes care of the generator, and distributor or magneto drive. The fan is a four-blade, aluminum casting, of the propeller type. Either battery or magneto ignition can be employed with the engine. When magneto ignition is used, the magneto is mounted on a bracket to the rear of the generator and driven through the pump and generator shaft. When battery ignition is used, the distributor is driven by a vertical shaft just to the rear of the timing gear case. The bracket for

the magneto and generator are cast on the crankcase.

The engine is provided with standard S. A. E. bosses throughout. Its weight is 600 lb. It is manufactured by the Rochester Motors Corporation.

Cooling Surface Requirements of Airplane Engines

FLIGHT tests were recently made at McCook Field, Dayton, Ohio, on a Fokker D-VII equipped with a 200-hp. Mercedes engine to determine the effectiveness of the cooling system. It was found that during climb the system operated on a temperature difference of 71 deg. C., which will insure against boiling with a normal air temperature gradient and 75 deg. F. ground temperature. This is 16 per cent cooling capacity less than U. S. Air Service requirements, and is characteristic of European planes. Cooling requirements in Europe are not as severe as those in the United States.

The shape and position of the radiator are advantages from the standpoint of installation and clean design, although effectiveness of cooling surface is somewhat decreased at the sides by the slanting core face. It is not a very satisfactory radiator for production, owing to the use of tubes of several different lengths. The shutter is unsatisfactory, giving poor control, owing chiefly to its failure to tightly cover the air passages through the radiator core and it being in the rear of same.

The over-all dimensions of the radiator were 28 in. in width, 25 in. in height and 12 in. in depth, and the

weight was 48 lb., empty. The frontal area in the direction of travel was 1.45 sq. ft.; the cooling surface, 126 sq. ft.; the outside diameter of the core tubes 0.250 in. and the thickness of the walls, 0.007 in.

Curves published in connection with the report show that the circulation was at the rate of 70 gal. per min. for a corrected pump pressure of 2 lb. per sq. in.; 98 gal. per min. for 3 lb. per sq. in. and 132 gal. per min. for 5 lbs. per sq. in. The cooling system reached a maximum temperature between 3000 and 4000 ft. altitude, the jacket inlet temperature then being 70 deg. C. and the outlet temperature 76 deg. C., which gives a water temperature gradient of only 6 deg. C. or 11 deg. F.

THE final report of the Chief of Air Service A. E. F. to the Commander-in-Chief, American Expeditionary Forces is printed in No. 180 of the Air Service Information Circular, dated Feb. 15, 1921. It contains an account of all the activities of the Air Service from the time the United States entered the war to the signing of the Armistice, with numerous tables and diagrams. Concerning the Liberty engine it is said that "in actual service it fulfilled the highest hopes of it which had been entertained."

An Analysis of the Automatic Ignition Advance Mechanism

Desirable rate of advance is for most engines a direct function of speed, but since centrifugal force increases as square of speed a compensating mechanism, the design of which is here outlined, is required.

By C. H. Hindl

ONE of the advantages of electric ignition is the ease and accuracy with which the spark can be timed. It is the purpose of the following paragraphs to deal chiefly with the method by which the spark timing is automatically controlled.

The point where ignition occurs is of considerable importance in the operation of the engine. Although the phenomenon of combustion is not clear in some of its details, it is a well-known fact that a considerable interval of time passes between the periods in which ignition occurs and in which the combustion of the mixture is complete. This period is usually spoken of as time required for the flame to propagate to various parts of the cylinder. In addition to the time required for the combustion of the mixture, there is an additional interval of time before any pressure is obtained in the cylinder. In other words, the flame travels part way through the combustion chamber before any pressure is registered on the piston. Since it is desired to utilize this pressure during the power stroke and have complete combustion before the end of the stroke is reached, it is necessary to carefully regulate the time when ignition occurs with respect to the piston position.

In the early days of the automobile, drivers were more or less skilled in the operation of the engine and controlled the spark advance by hand according to the "feel" of the engine. However, the use of the automobile has increased to the extent that the driver in most cases is not familiar enough with the engine operation to adjust the spark to the position for best engine efficiency. As a result, the engine may run hot and lose power on account of the spark being too far retarded or the spark may be advanced excessively, causing loss of power and knocking. Another serious disadvantage of hand control becomes effective when the engine is started, as the spark may have been advanced to a degree that will cause backfiring, which might seriously damage the starting motor and its mechanism, while with automatic advance the spark is always retarded at cranking speeds so that backfiring cannot occur.

The usual automatic advance mechanism varies the ignition timing in accordance with the speed of the engine

through the use of centrifugal force caused by weights revolving with the ignition drive shaft. This is usually accomplished by fixing the pivot of the weight integral with one shaft and having another point on the weight connected to the other shaft by means of a pin and slot or by levers. The weights should be of such size that the amount of advance will not be affected by friction or vibration. The mechanism should be designed so that the resulting forces due to driving torque produce the least possible turning of the weights about their pivots, especially at slow speeds, when the centrifugal force is small and any forces due to friction or driving torque are comparatively large. However, the cost, accuracy, space available, and

appearance must be considered in determining the design of the advance mechanism.

The desired rate of advance for most engines is approximately a direct function of the speed. It is usually convenient to design the pin and slot or link mechanism so that the angular movement of the weights will be nearly proportional to the spark advance. If such conditions exist, it is necessary that the weights move about their pivots through an angle that is practically pro-

portional to the speed. Since the centrifugal force on the rotating weights increases with the square of the speed and the tension of the spring only directly with its elongation, it becomes necessary to place the spring so that either its elongation or its moment arm increases rapidly as the weights swing outward. Since the centrifugal force of the weights is small at low speeds, the effect of the springs must be slight when the weights are in their initial position. This is usually accomplished by making the elongation on this position very small and by having the line of action of the springs pass nearly through the pivot of the weight, resulting in a small moment arm through which the spring may act.

A general case is illustrated in Fig. 1 and will be used in the following analysis. The method of analysis can be applied readily to practically any form of similar mechanism.

Let O be the shaft center;

A , which is integral with the shaft, the pivot center of the weight;

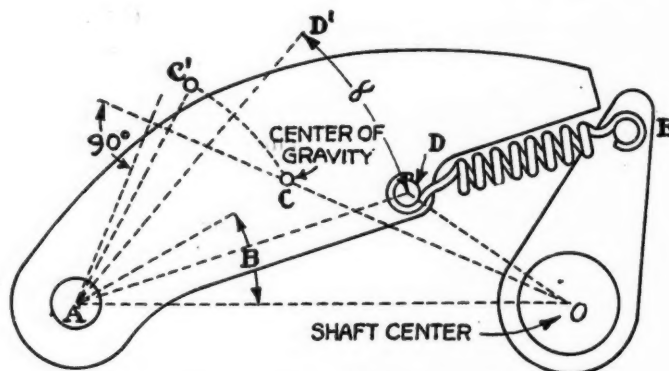


Fig. 1—Diagram used in deducing the formula expressing relation between angular motion of pivoted weight used in advance mechanism and speed of driving shaft

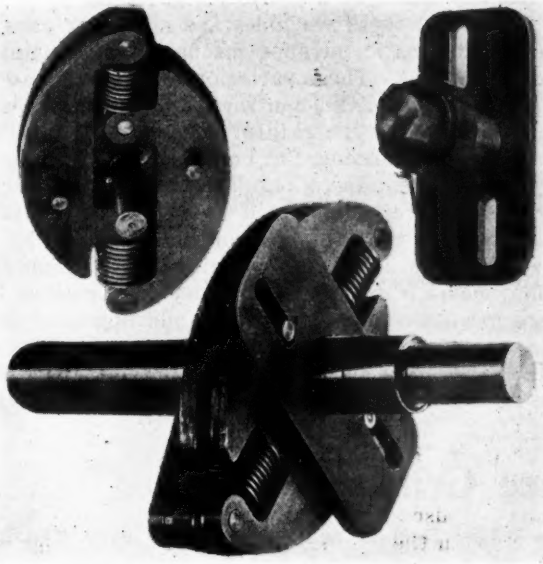


Fig. 2—Examples of the pin and slot advance mechanism

C the center of gravity of the weight;

D the point where the spring is attached to the weight;

E the point where the spring is attached to the fixed pin integral with the drive shaft.

Let B be the angle between AC and AO when there is no rotation and assume ADE to be a straight line which will be approximately true, since any tension of the spring in this position should act through a small moment arm about the point A . As the device rotates, the weight swings outward about the point A , and the points C and D take the respective positions C' and D' . Assume the angle through which the weight swings to be α .

The centrifugal force on the weight acts radially along the line OC' and will be equal to

$$C.F. = \frac{w}{g} \frac{v^2}{r} \dots \dots \dots (1)$$

$$v = 2\pi r N$$

Where r is a variable and equals the distance from the center of gravity to the shaft center in inches. N equals revolutions per second of the ignition shaft. w is in pounds and g in inch-second units.

$$C.F. = \frac{w}{g} (2\pi N)^2 r \dots \dots \dots (2)$$

The moment arm L through which the centrifugal force acts to rotate the weight about its pivot is

$$L = \frac{(OA)(AC) \sin(\alpha + B)}{r} \dots \dots \dots (3)$$

This represents the length of a line drawn perpendicular to the line of action of the centrifugal force which acts along the line OC' . The moment due to centrifugal force acting on the weight is the product of (2) and (3)

$$\text{or Moment} = \frac{w}{g} (2\pi N)^2 (OA)(AC) \sin(\alpha + B) \dots \dots \dots (4)$$

As the weight swings outward the spring elongates and takes a position such as ED' .

S = length of spring

$$= \sqrt{AE^2 + AD'^2 - 2(AE)(AD) \cos \alpha} \dots \dots \dots (5)$$

and since DE is the free length, the spring elongation

$$\delta = \sqrt{AE^2 + AD'^2 - 2(AE)(AD) \cos \alpha} - DE \dots \dots \dots (6)$$

If a spiral spring is considered and the following nomenclature is used,

P = tension in pounds;

r = mean radius of spring;

n = number of turns;

K = torsional modulus of elasticity for steel = 12500000;

d = diameter of the spring wire.

the elongation of the spring is

$$\delta = \frac{64 P r^3 n}{K d^4} \dots \dots \dots (7)$$

Substituting the value of δ from equation (6) in equation (7) and solving for the spring tension

$$P = \frac{G d^4}{64 r^3 n} \left\{ \sqrt{AE^2 + AD'^2 - 2(AE)(AD) \cos \alpha} - DE \right\} \dots \dots \dots (8)$$

The moment arm N through which the spring tension acts equals

$$N = \frac{(AE)(AD) \sin \alpha}{\sqrt{AE^2 + AD'^2 - 2(AE)(AD) \cos \alpha}} \dots \dots \dots (9)$$

And the moment of the spring acting on the weight about its pivot is equal to the product of (8) and (9).

$$(P)(N) = \frac{G d^4}{64 r^3 n}$$

$$\left\{ (AE)(AD) \sin \alpha - \frac{(AE)(AD)(DE) \sin \alpha}{\sqrt{AE^2 + AD'^2 - 2(AE)(AD) \cos \alpha}} \right\} \dots \dots \dots (10)$$

For a state of equilibrium the moment exerted by the spring must equal the moment exerted by the centrifugal force of the weights.

Hence equating (4) and (10),

$$N^2 = \frac{G d^4 g (AE)(AD)}{64 r^3 n W (2\pi)^2 (OA)(AC) \sin(\alpha + B)} \left\{ \sin \alpha - \frac{(DE) \sin \alpha}{\sqrt{AE^2 + AD'^2 - 2(AE)(AD) \cos \alpha}} \right\} \dots \dots \dots (11)$$

This expresses the relation between angular rotation of the weight and the speed of the shaft.

A convenient manner for proceeding is to approximately assume the size and position of the weight and the position of the spring. The size of the spring can then be found by substituting the maximum value of speed and the desired value of α .

The maximum stress in the spring should then be checked and should be less than 50,000 lb. per sq. in. in order that the characteristics should not change during service. If the stress and the space available for the spring are correct, a curve should then be plotted between N and α , using equation (11). This shows the movement of the weight with speed. Some mechanism must then be utilized to convert the motion of the weight into shaft rotation, or, in other words, produce advance. Two types of such mechanisms are illustrated in Figs. 2 and 3. The



Fig. 3—Example of a link-type advance mechanism

pin and slot method of Fig. 2 is usually more convenient, since the slope and the length of the slot may be varied to suit any desired advance, while the links can be varied only through certain limits.

If the weights and spring have been determined and a curve has been plotted between N and α , it then becomes necessary to apply a mechanism similar to Figs. 2 and 3, which will convert the motion of angle α into rotation of the shaft which carries the ignition cam. This mechanism should be designed so that the resulting curve between speed and spark advance will follow points determined experimentally for the particular engine.

The use of a properly designed automatic advance ignition unit will produce greatest economy of automobile operation with the average driver. However, the throttle opening, amount of carbon in the cylinder, and the varia-

tion in fuels affect to a certain degree the proper point of ignition, and these variables are not taken care of by the usual automatic advance mechanism operating as a function of speed. These variations have led some manufacturers to apply hand control in addition to the automatic in order that the skillful operator can occasionally vary the ignition timing for best operation. There have been various attempts to regulate the advance by means of the throttle opening itself and also in conjunction with speed, but the complications involved are no doubt greater than the advantages obtained. Although the future may develop devices which vary the ignition timing through means separate from, or in addition to, speed control in an attempt to produce maximum economy, it is certain that present devices will fulfill the specifications required by the engine designers for a number of years.

New Rotary Surface Grinder

A NEW machine designed for grinding rings, discs and cylinders which must have flat and parallel surfaces has been brought out by the Pratt & Whitney Works. It is of heavy, compact construction, permitting of heavy cuts and large output. It is claimed that sensitive adjustments, with convenient control, provide for rapid production on gear blanks, washers, cutter hubs, sprockets or other work requiring extreme accuracy. In addition, means are provided for grinding concave or convex surfaces.

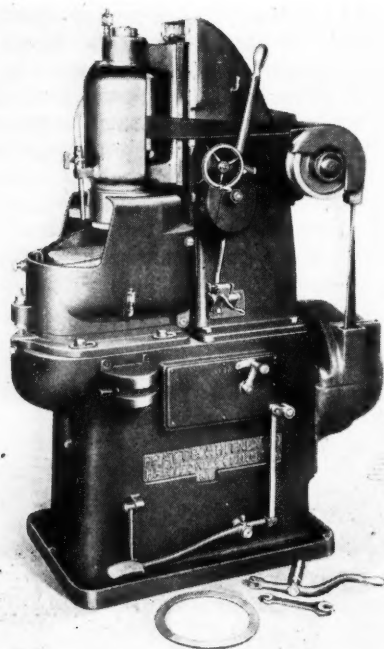
The spindle is mounted on ball bearings provided with adjustments for wear. The wheel is cemented in a holder screwed to the spindle, which makes changing a simple task, and a band clamped around the wheel guards against breakage. Surrounding the wheel is an adjustable steel guard which covers the entire wheel when raised to the idle position, so that chuck work can be handled safely.

The rotary magnetic chuck has two speeds and can be tilted for concave or convex work. This chuck is controlled by a pedal, and a connecting brake retards the rotation when stopping. The magnetic chuck is controlled through a switch on the side, which also acts as a demagnetizer.

The wheel feed is controlled by a lever like a drill press, and a position stop is provided to grind to a specific thickness. Fine adjustments are made through a hand wheel which can be locked and used as a feed wheel when desired. Back lash is neutralized and the wheel slide is over-weighted for easy control and extreme accuracy.

The machine is equipped with a pump, and the tank is located within the column. Lubricant is supplied to the inside and outside of the wheel, the flow being regulated by valves, and an adjustable hose takes care of washing the chuck and work. The tank can be cleaned from a removable settling pan. The shut-off valve is ordinarily controlled by the feed lever, but can be disconnected and operated by a pull knob. The spray is confined by a guard, the front of which can be lowered for work handling.

Belt drive is regularly furnished and is fully guarded at all points. The main drive shaft and idler pulleys are mounted on ball bearings and the clutch is mounted on a thrust bearing to take the load. The two-speed gear shaft is mounted on bronze bearings and the gearing runs in oil, the bearings being lubricated by the splash system. A flexible coupling takes care of chuck tilt and alignment.



Pratt & Whitney 8 inch rotary surface grinder

Great Britain to Stop Airship Development Work

IT was recently announced that the British Air Ministry had definitely decided to give up all its airship activities and hand over its airships, material and stations to the Disposal Board provided no offer was received before Aug. 1 from a British company prepared to take over and run the airships on a commercial basis. The airships available are the R 80, R 33, R 36, R 37, L 64 and L 71. Of these vessels the second last and last are the large airships surrendered by Germany in accordance with the Peace Treaty. Airship R 37 is nearly completed, but work has now been stopped on it, while R 36 is fully equipped as a passenger carrying vessel. These ships the Government is prepared to hand over, free of charge, to the proposed British commercial airship company. In addition, it is willing to present the company with all its other airship material and stores, to assist it with information, to lend it airship specialists for a limited period, and to sell or lease to it the airship stations at Cardington and Pulham. It is officially explained that the Government's decision to give up airships as a fighting service was arrived at only in view of the urgent demand for economy.

Grinding in the Automotive Industry

Part II.—Development of Specialized Forms of Grinding

The first grinders were employed for general work. A demand arose, however, for specialized forms, for grinding methods that could be used in production work. This article follows up the discussion of types of grinding wheels and traces the development of special forms of grinding.

By P. M. Heldt

UNDOUBTEDLY the first class of grinding in the machine shop was tool grinding, because tools of hardened steel could be given a cutting edge only by means of the grinding wheel. The grinders employed, however, were not what are to-day known as tool room grinders, by means of which it is possible to grind geometrically exact cutting edges on the tools, but rather floor stand grinders. These same grinders were used for snagging and other offhand work, and are so used to-day.

The same as in the machine tool line universal types of machine, such as engine lathes, came into extensive use first, in the grinding field the first machines developed were universal grinders on which it was possible to do almost any job that might come up in the machine shop. Universal grinders still have a large field, in tool rooms and jobbing shops, and are to-day being manufactured in highly developed designs.

As the use of grinding as a manufacturing operation increased there arose a demand for grinders for special purposes which should have all the characteristics of production tools, that is, low cost due to simplicity of design, and a high degree of automaticity with consequent low labor cost and high output. The first type of production machine was probably the plain cylindrical grinder. In a booklet on Principles of Cylindrical Grinding issued by the Norton company there is illustrated an early type of cylindrical grinding machine made by Ambrose Webster about 1861. The machine has a rather primitive appearance and does not seem to have come into commercial use. Cylindrical grinding as a recognized machine shop operation is only a little over 30 years old. One of the first concerns to introduce it was the Geiser Mfg. Co. of Waynesboro, Pa. (now the Emerson-Brantingham Co.), manufacturers of agricultural machinery, including steam traction engines. About 1889 A. B. Landis built for the concern a machine for finishing the crankshaft bearings of these engines by grinding instead of draw-filing and polishing. The Geiser Mfg. Co. also was among the first concerns to grind piston pins and crosshead pins. It is related that the first machine built by Landis remained in practical use until 1915. Some trouble was at first experi-

enced because only a drip of water was used, but when a stream of water through a $\frac{3}{4}$ -in. pipe was substituted for this the process proved a success.

Following is an enumeration of the different forms of grinding practised in the automobile and allied industries to-day:

Offhand grinding, including snagging of rough castings.

Cylindrical grinding.

Internal grinding.

Surface grinding.

Disc grinding.

Ball grinding.

Cam grinding.

Gear grinding.

Form grinding.

Tool grinding.

A representative machine of the universal type is the Bath, manufactured by the Universal Grinding Machine Co. With the aid of a number of attachments it can be

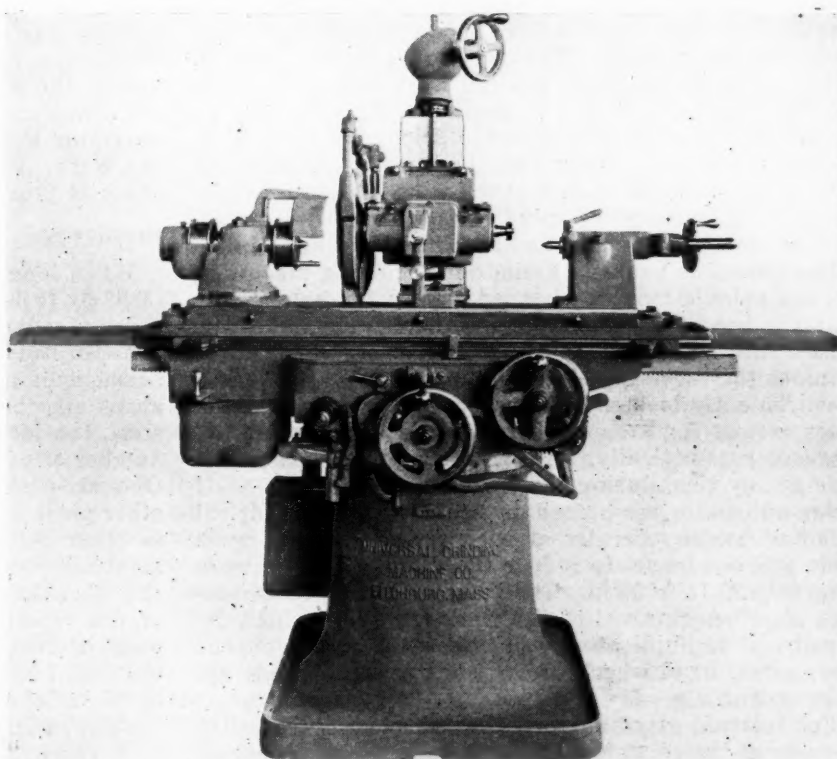


Fig. 1—A typical universal grinding machine equipped for cylindrical grinding

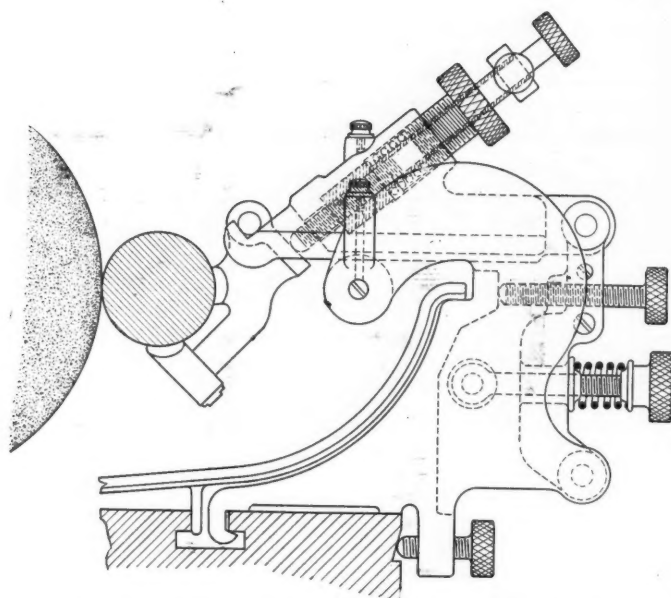


Fig. 2—A form of back rest used in cylindrical grinding. (Brown & Sharpe design)

used for cylindrical, internal, surface, cutter and reamer grinding. An illustration of this machine is shown herewith. The base is a single casting of column form, to the top of which is bolted an internally ribbed vertical column with a circular flange base as large as the machine base. To this vertical column is gibbed the grinding wheel head, which has a vertical movement. The cross slide knee, which carries the cross and longitudinal slides, has a large circular base that fits over the cylindrical part of the vertical column, thus providing a bearing of liberal dimensions for the knee to swivel on, the knee being swung around the column to bring the work table into the proper relation to the wheel for the various operations the machine may be used for. The knee is graduated in degrees and can be clamped at any angle from 0 to 90 degrees.

The cross slide provides means for feeding the work into the grinding wheel and carries the work table and operating mechanism. The table is provided with a swivel plate for grinding tapered work and has a scale graduated in in. p. ft. and in degrees. With the regular equipment the machine is adapted chiefly for cylindrical grinding, the work being held between centers in the head and footstocks or in a chuck in the head stock and revolved. The footstock spindle is provided with a variable tension spring controlled by a handwheel and quick acting lever, as usual in cylindrical grinding machines, but the spindle may be clamped rigidly for holding the center to the work. The table is controlled by adjustable dogs operating against the reversing lever, which latter actuates the reversing clutch, or it may be controlled by a conveniently located hand reversing lever, which provides means for stopping the table at the end of its traverse automatically, by giving the lever a part of a turn at any time during the traverse of the table.

An automatic cross feed is provided for cylindrical grinding, which operates at each reversal of the work table and can be set to reduce the diameter of the work from 0.00025 to 0.005 in. The automatic cross feed operates at either reversal of the work table or at both reversals. For duplicating work there is a stop on the cross screw hand wheel. Work and traverse speeds are independent.

For internal grinding a rigid attachment is bolted to the side of the column near its base, in which the wheel spindle is supported, the latter being driven from a

pulley which is clamped on the nose of the main wheel spindle. The work is held in a chuck. For surface grinding another attachment is furnished, which is secured to the grinding wheel head. The attachment spindle is screwed to the main wheel spindle and is driven through it. In this case the table is swung around through 90 deg. A universal work holder is furnished with the machine which adds to the variety of work which can be done upon it. This holder is particularly valuable in tool grinding.

In cylindrical grinding where the work is held between centers or in a chuck, it is revolved in the same direction as the wheel; that is, if the wheel turns right-handedly the work is also revolved right-handedly, so that the surfaces of the work and the wheel between which the grinding action takes place move in opposite directions. In internal grinding where the work is held in a chuck, work and wheel turn in opposite directions. Sometimes parts have to be ground cylindrically that cannot be held either in a chuck or between centers. They may then be laid in a Vee block and the wheel fed up against them, in which case the work will be revolved in the opposite direction as the wheel, so that the surface motions at the points where grinding takes place are in the same direction. While this is not as satisfactory as having wheel and work revolve oppositely, cylindrical surfaces can be obtained in this way.

The motion of the wheel head in the direction of the wheel axis is known as the traverse. Naturally a grinding wheel cannot remove a great depth of metal at one passage, and the grinding wheel is therefore traversed continuously, being fed forward automatically at the end of each traverse or after every second one. In repetition work the feed stops automatically when the work has been reduced to the desired diameter. Of course, wear of wheel is not allowed for in this, but the operator soon learns how many parts he can grind before the wheel has worn down an amount equal to the smallest possible adjustment of the cross slide, and he will then make the adjustment after passing that number of pieces through.

Plain cylindrical grinding machines are manufactured in a great variety of designs. They usually have a box-casting type of base with headstock and footstock gibbed thereon, a wheel head, gearing for driving at various speeds the work spindle and the wheel spindle, a drive for traversing the wheel and automatic mechanism for reversing the wheel travel and feeding the wheel toward the work. In addition to the automatic feed mechanism there is provision for hand feed.

Steadyrests

When long, slender pieces have to be ground, trouble is likely to be experienced from shattering, and in such cases steadyrests should be used. These comprise two shoes or saddles with a face in the form of a cylindrical segment of the same radius as the finished piece. The shoes may be made either of wood, brass or hardened steel, the latter material being preferable when a large number of parts of the same dimensions are to be made. One shoe should be located underneath the shaft or other piece of work. Some makers recommend placing it as close to the wheel as possible, so as to take the substantially tangential component of the reaction between the wheel and work and overcome the drawing-in action of the wheel. The other shoe is located opposite the point of contact between wheel and work, so as to take the radial component of the reaction. Both shoes should be of sufficient width to span any slight inaccuracies in the circumference of the work. Steadyrests are provided with screw adjustments for both shoes so as to adapt them for use with work of different diameters. In grind-

ing camshafts, steadyrests of the enclosed type are often used, somewhat similar to lathe steadyrests, in which the camshaft turns under very much the same conditions as when assembled in the engine.

Surface Grinding

Plane surfaces are ground either with the circumferential surface of cylindrical wheels or the ends or faces of ring wheels. In the ordinary surface grinder the work is mounted on the table which is jibbed to the base, table and work being fed past the stationary wheel head. Where the grinding is done with the side of the wheel the wheel spindle may be either vertical or horizontal and the work table fed past the wheel head or else the work table may revolve around its axis. When grinding with the side of a ring or cup wheel the cutting area naturally is comparatively large, and, in consequence, stock is removed quickly and great power is absorbed.

In addition to grinding plane and cylindrical surfaces it is also possible to grind surfaces of revolution whose section comprises one or more circular arcs or even irregular curves and straight lines. This is known as form grinding, and its most important applications in the automotive industry are in the grinding of ball bearing rings and of the grooves in splined shafts. In order to do this grinding the grinding surface of the wheel must be given the proper form by truing it with a forming device. Circular arcs can be easily formed on the wheel by mounting the truing diamond on a pivotal truing device having the proper radius. For irregular shapes the diamond must be guided by a former of the same shape as the section of the cutting surface to be produced. The majority of ball bearing rings, especially in the larger sizes, are ground in oscillating grinders, but some of the smaller rings are ground in plain grinders with formed wheels.

Disk Grinding

Disk grinders are machines in which a circle of abrasive material is supported by a steel disk. Originally this form of grinder was used only for polishing and light finishing, but recently the disk grinder has come to be quite a production machine. The machine is used chiefly on work which has previously been turned, shaped, planed or milled, so that it has one true surface to which the surface finished in the disk grinder is usually perpendicular. Disk grinders are of exceedingly simple construction. The usual single spindle type comprises a floor stand with two split bearings at the top in which

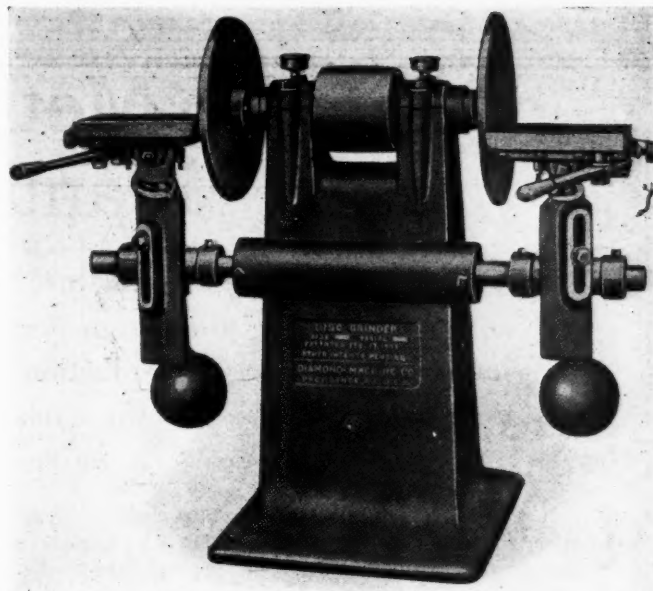


Fig. 3—Disk grinder with hand lever feed (Diamond)

are supported the spindle carrying clamping collets for the two steel disks and the pulley by which it is driven. Tables on which the work is held are mounted in such a way as to be universally adjustable. In the more elaborate designs ring wheel chucks can be substituted for the disks, the tables are provided with T grooves and are fed toward the disks by means of a hand lever. The abrasive circles are cemented to the disks by means of a special press furnished with the machine.

Plain tables which are rigidly clamped in position are used when the work is to be forced against the disk for squaring up and when a small amount of stock is to be removed. Semi-universal swinging tables are provided with a counterweight, which permits of swinging them across the face of the disk, thus facilitating rapid removal of stock. Universal swinging tables have a tractor in addition to the counterweight, which makes it possible to accurately grind angles on them.

When it is desired to produce duplicate parts in large quantities and remove considerable stock, use is made of a universal lever feed table. The table is fed toward the disk by a lever and link motion, the feed being limited by a micrometer stop.

(To be continued)

Condensers in High Tension Circuits

IN Germany tests have recently been made on "spark intensifiers" in the form of condensers in the secondary circuit, connected across the spark plug gap. In an article on the subject in *Der Motorwagen* it is claimed that the auxiliary gap type of spark intensifier is of little practical use; that the effect of such intensifiers on the spark cannot be noticed by direct observation and that the effect on the ignition apparatus is detrimental, especially if the auxiliary gap is located close to the spark plug. With a condenser in parallel with the spark plug gap, very favorable results are said to have been obtained. The effect is to produce during the sparking period condenser discharge oscillations which are remarkable on account of their high capacity and current strength. Experiments have shown that condensers of from 250 to 400 cm. capacity are best suited.

Tests on engines fitted with condensers in parallel to

the spark plug gaps were made the past year by Professor Becker in the Internal Combustion Engine and Motor Vehicle Laboratory of the Berlin-Charlottenburg Technical High School. When visibly operating spark plugs were provided with a condenser in parallel, a material increase in spark volume was observed. Comparative tests on a 10-25-hp. Adler automobile engine with and without spark intensifier showed an increase of 14 per cent in the output at 1000 r.p.m. when operating on a benzol-kerosene-gas oil mixture of the proportion 40:50:10, and an increase of 6 per cent in output at 1400 r.p.m. when operating on kerosene. A test run with a 16-45 Mercedes-Knight-engined car showed that with the same carburetor adjustment the car would run on one liter of fuel, 5.9 km. with condensers and 5.2 km. without, indicating a saving in fuel of 13.5 per cent when condensers were used.

Production Methods in Armature Manufacture

Several details of the armature manufacture described here are well adapted to other production work. The article presents, moreover, an intimate discussion of production methods in making this widely used unit. The importance of the human element appears in several instances.

By Norman G. Shidle

MANUFACTURING methods in parts plants are of interest to the automotive engineer and production man in several ways. By studying such methods he becomes familiar with the details of practice in the related industry and is better able to discuss design and specification problems with relation to production limitations. Production in parts plants, moreover, frequently includes minor production methods which may be advantageously adapted in the manufacture of other units made within the automobile plant itself.

Both these advantages are to be found in examining the production of the generator armature for a well known passenger car at the Springfield plant of the Westinghouse Electric & Mfg. Co. The equipment used for stamping out the core laminations, for instance, carries excellent suggestions for stamping out other flat metal parts, while the knurling operation on the armature shaft is performed in a specially efficient manner. There is a general interest, too, in the importance of the human element in certain key operations. These factors can be examined in proper perspective through a detailed description of the production operations.

There are nineteen operations in the shaft. Fig. 1 is a drawing which indicates the form of the finished shaft. The first operation is performed on an automatic screw machine. This machine turns and faces the rough stock, necks the shaft in two places, centers one end, and cuts off the piece.

One end is turned and threaded in the next operation, which is performed on a Warner & Swasey lathe. The other end is also centered. A Wisconsin hand miller then cuts the keyway.

The next operation is that of grinding the shaft for knurling. The shaft must be ground down to allow for the increased diameter which results from knurling. The knurling operation, next performed, is specially interesting, since the method used permits of high production, and yet is comparatively simple. Fig. 2 is a close-up of the machine on which the knurling is done. The shaft is placed in the slot at the inside of the table. The knurling tool, shown in the photograph, is a flat piece. It is given a rectilinear downward motion like that of a stamping press, turns the shaft, and imparts the knurl.

The knurlings serve the function of firmly holding the laminations in any degree of spiral arrangement of armature slots and of taking the place of the various types of keyway necessary with other methods.

After having been knurled, the shaft is heat treated and tempered. It is then necessary to clean the centers and straighten the shaft, since some slight warping usually results from the heat treatment.

A series of six grinding operations are next performed on Norton grinders. First the commutator is rough ground, then the main bearing and the gear seats are rough ground. Finish grinding the small bearing follows next, and then the finish grinding on the gear seat, commutator seat and main bearing in order. The shaft is then sent to a lathe and the shoulder on the back of the oil thrower is faced. An inspection of the shaft completes the operations on this unit.

Punching Core Laminations

The metal sheets from which the core laminations are punched are "coated" immediately upon arriving at the plant. This work is done with a machine which facilitates the handling of the bulky material. The sheets are placed on a continuous conveyor and are moving steadily while being painted with a rust preventing and insulating compound.

The sheets are then slit into strips of a width suitable for the press work. Slitting rolls are used for this operation, by means of which a number of strips can be slit at the same time. The slitting rolls are illustrated in Fig. 3.

The next operation, that of stamping out the core laminations, is performed in a specially effective way. A Bliss 73¾ power press is used, and a special three part die stamps out the pieces. Like all the other presses and machine tools in the plant, this press is operated by an individual electric motor. The press is equipped with rollers on each side. The strip of metal is inserted in the rollers on one side, the rollers are started moving, and the strip moves through the die and is pulled out through the rollers on the other side. It is necessary for the operator merely to insert the strip in the rollers and start the press. There is no danger connected with the operation, and the production capacity is greatly increased by means of these rollers. The speed of the press can be regulated in accordance with the kind of work, and the principle involved is applicable to innumerable stamping jobs of similar character.

There are three parts to the die, as noted previously. The first die stamps the main outlines of the laminations, the second die straightens the piece, and the third part pushes it through the die. Fig. 4 shows the details of this operation and the dies which are used in its performance.

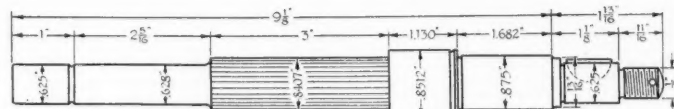


Fig. 1—Drawing of finished armature shaft

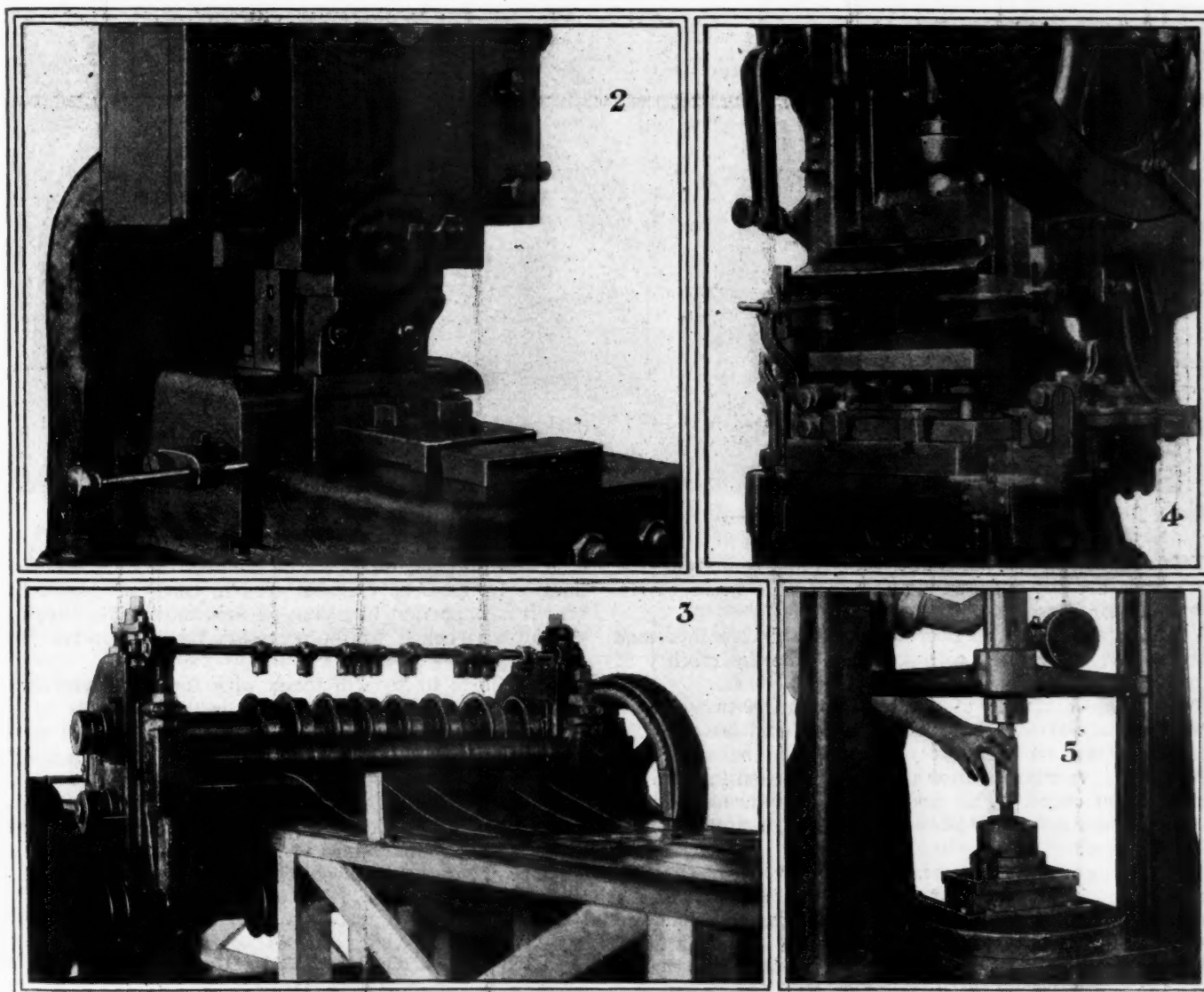


Fig. 2—Knurling machine. Fig. 3—Rolls used in slitting metal to sizes suitable for punch press in punching core laminations. Fig. 4—Roller feed punch press and dies used in stamping core laminations. Fig. 5—Assembling core laminations to shaft

Assembly Begins

The next operation consists in placing a given number of core laminations together, the same side up in each case, and of tying them together. This is known as the "match, weigh, and tie operation," the number of laminations being determined by weight. The tying is done simply for convenience in handling.

Next the laminations are staggered to the proper degree and are held in that position by means of specially made skewers, whereupon they are placed in a die in a Lucas press. The knurled shaft is then forced through the laminations as shown in Fig. 5. It is evident that very careful work must be done in grinding and knurling the shaft, since the diameter of the knurled part of the shaft and the diameter of the hole in the laminations must bear a very exact relation to each other. The knurled part is forced into the compressed laminations, holding them firmly. The slots are filled during the next operation.

The commutators are obtained from the commutator department of the Westinghouse plant at Pittsburgh practically finished. The commutator slots are merely milled and burred, and the commutator is inspected.

Insulation, in the form of a heavy fish paper, is next placed in the slots of the core. This is followed by the

important operation of winding. It is difficult to describe the intricacies of this operation in a few words, although the general principles are commonly understood. To perform this task efficiently and accurately, however, takes many months of training and experience. It is the sort of job that a person must learn through practice, and it is one of the important key operations in armature manufacture.

It is interesting to note that the human element enters into this work so strongly at this vital point. On some jobs, the increased labor supply during recent months has made easier the obtaining of skilled workmen, but on this operation, which can be done by only a few, the labor surplus has had practically no effect. The degree to which the human element enters into any given operation varies, of course, but there is no industrial work into which it does not enter in an important way if observations are made over a long period of time. This winding operation is interesting as one of the more obvious examples of the importance of this phase of production studies.

After the cores have been wound, they are tested for grounds. This work is done by girls, but the winding operations are performed by men. Next the commutator and oil thrower are pressed on. The armature then goes to



Fig. 6—Scraping and connecting lead wires

girls at a bench, the wires are scraped and connected, and the leads are set and sweat soldered to the necks of the commutator bars.

Special shaped white fiber wedges are driven into each armature slot over the coil winding. The desirability of this is apparent.

The large diameter of the commutator is turned in a lathe and the armature is then inspected and tested. The armature is then ready to be dipped and baked. It is dipped in a varnish solution and is then baked in specially constructed ovens. This process is gone through twice. Prior to the first dip, however, the entire unit is thoroughly dried.

When the armature comes from the oven the shaft is cleaned and is inspected for straightness. The face of the armature parallel with the shaft is then ground, followed by a bearing grinding operation. The next operation takes the armature to a lathe, where the commutator is turned and the oil thrower is faced to length. Next the oil thrower is faced to gauge, and the commutator is turned again. The mica insulation between commutator bars is then undercut on a hand miller, and the commutator is polished on a lathe.

The armature is then balanced and passes on to a final inspection, after which the style number is stamped on it. A cotter pin hole is drilled in the shaft and this is followed by the necessary re-threading operation. This completes the process of manufacturing the automobile generator armature.

When working at capacity, about 1200 generator armatures can be produced per day, a force of 480 men being engaged on armature work.

The automotive section of the new plant has a capacity of 1000 generators and 1000 starting motors a day, and employs about 1000 men for peak production.

The relation of the human element to production is well illustrated in the experience of this plant. As in most other factories, it has been necessary to lay off a number of workers since the beginning of the industrial depression. The employment department made an effort to keep in touch with these men, so that they might be reinstated when business picked up again. Recently it was found necessary to increase the working force considerably. Old employees were sought. Many of them were brought back into the plant, thus saving much money which it might have been necessary to expend in breaking in new workers.

It was found, however, that the better workers in a few cases had already found jobs elsewhere and were not avail-

able. This is an indication of the fact that a good workman is likely to be valuable even in times of depression; that it is important in laying off men to consider carefully the future when it will be necessary to build up the force again.

The efforts to keep in touch with former employees at this plant have resulted in great benefits already in rebuilding the force again. It has been found well worth while to follow up former employees, to have them leave the plant with a feeling of goodwill, and to have them eager to return again when the opportunity offers. It is not the policy here to "take it out" on labor for past conditions. The maintenance of rates once set, and a general attempt at practical honesty is producing excellent production results.

Tests by the Bureau of Standards of Centrifugally Cast Steel

THE production of metal castings by the centrifugal process may be said to have passed beyond the experimental stage; at least, in the case of certain non-ferrous metals and cast iron shapes. However, very little appears to have been published concerning centrifugally cast steel. Opportunity was given to the Bureau of Standards to examine in detail the physical and chemical characteristics of six centrifugal castings made by the Millspaugh process.

The results are interesting since they show what may be expected from such metal as compared with the product of more usual manufacturing processes. The advantages to be expected from centrifugally cast steel are physical soundness and freedom from chemical segregation and thus the elimination of waste metal to be discarded, which last is always a very important factor in other casting processes. For certain shapes forging and boring operations may be eliminated.

The investigation shows that highly satisfactory castings which are physically sound and free from serious segregation, can be produced by the centrifugal method. It is shown that the properties of these castings can be greatly improved by subsequent heat treatment, the resulting metal being in a condition to compare favorably with metal that has been forged.

Technologic Paper No. 192 of the Bureau of Standards dealing with the above subject may be secured from the Superintendent of Documents, Washington.

Patching Body Panels—a New and Important Service Problem

Mr. Mercer recently visited many service stations and found that practically none of them had proper knowledge of body panel repair methods. Factories were not helpful. The problem is growing and demands attention of manufacturers. Repair methods are discussed here in detail.

By George J. Mercer

WHILE the average life of a car is something over five years, the body begins to deteriorate materially during the second season. Many minor faults, such as dullness of paint, worn spots in trimming, doors out of alignment, etc., often begin to show up. Such defects, perhaps, are to be expected to a certain extent, and the owner is usually willing to bear the burden of such renewals or repairs as may be necessary.

Where an actual break in the metal panels occurs, however, a different situation is presented. Such breaks do occur, and in most cases the owner is likely to protest loudly that he has not received fair service from his car. Consequently, the matter of repairing damage of this kind is extremely important.

Before discussing the methods of repair for steel and aluminum panels the causes of the breakage may be analyzed, since to eliminate those causes would be to eliminate the damage and the dissatisfaction. There are two chief causes to which such body breakage may be attributed:

1. Unfair conditions of usage
2. Inferior quality of workmanship

Extreme weave of the chassis frame usually results from sudden stopping and starting, rapid acceleration and other similar jars to the frame. Every violent swing twists and strains the car body. It is only a matter of time until the framing will weaken at vulnerable points and cause the metal to break through continual bending.

Roadsters and coupes generally give out first around the door opening of the rear compartment, because the opening space makes for high local stress at the four corners. If these points are rigid enough to withstand the strain, the joint between the rear deck and the rear panel is likely to part. This latter point is indicated by the letter "A" on Fig. 1.

Inaccurate design or poor workmanship often show up in improper fitting of the body to the frame. Subsequent body injury is invited when the body does not fit easily and without forcing at the points at which it is bolted to the frame. If the body is pulled down to make it touch at the bolt hole, the framing will bend and the panel will break at some place near to that at which the pressure is exerted. Strains will be set up, moreover, in other places by the pulling stress on the framework.

Poor workmanship also shows up in many other ways. Sometimes, for instance, the wood is so framed that a joint will come opposite a panel joint where excessive strains will occur. Again, joints may be poorly made

or the wood not well dried, so that it shrinks after being framed and draws away from the joint. The panels may be filed too thin at the welding points. This defect frequently occurs and is not readily detected until a break actually occurs.

In normal times few of these deficiencies should be present, but the results of the comparatively unskilled labor that was rushed into service during the last few years are showing up at this time.

The causes of the trouble being fully understood and the importance of such difficulties recognized, means for remedying breaks after they do occur must be devised. Methods for repairing steel and aluminum differ slightly, and both will be discussed here.

Steel is really the better material for panels for several reasons. The most important of these may be enumerated as follows:

1. It has greater strength
2. It is possible to join steel panels in such a way that they are as strong as any other part of the body
3. Irregular places can be filled with solder
4. There is less reason to file thin at joint points
5. Repairing is more simple; welding a piece into a steel sheet does not require the fine and intricate work necessary in welding an aluminum sheet
6. Although aluminum can be welded, it must be hammered and filed. Solder cannot be used for filling up irregular places

Assume, for instance, that the break at "A" was in a steel panel. It is probable that the break could be welded, the irregular part around the new weld filled with solder, and the underside reinforced to overcome weakness. Painting would then be the only additional operation necessary.

If the steel sheet is thin at the point of breaking, or if the cooling metal breaks at the same place after the first welding attempt, the material must be cut away until sound metal is reached. A piece can then be welded in. The metal should be lightly hammered around the weld as it cools. Water should never be used for cooling. The heat is kept within a small radius and protection is afforded the wood underneath by means of loose asbestos, packed tight by wetting with water. This asbestos is packed between the wood and panel and a ring of the same sheet is used around the weld. Just enough space is left to provide convenient working area for the torch. The roughness of the metal is leveled up with solder.

Suppose, however, that the same break occurs in an aluminum body. The procedure would be different. The first operation is to cut away the metal on all sides of

the break and insert a piece of size and shape suitable for the particular space.

An example of this operation is shown in Fig. 2. This piece or insert is slightly smaller than the opening, so that a space equal to the thickness of the metal sheet separates the edges of the panel from the insert on all sides. Thus the flame from the torch is allowed to pass clear through and to build up the weld from the bottom.

In Fig. 2 the break is shown cut away and the insert in place. The space, equal to the thickness of the metal all around, is also shown. To make the repair, the part to be welded is surrounded by wet, tightly packed asbestos fiber. This fiber has been hand molded into a ring and is placed as near as possible to the work. The piece is held in place until the welder can make a catch-hold at one or two places. Then the surface of the insert and panel are leveled with a hammer. The welding operation is then continued until the work is completed.

The welding outfit for repair work consists of the oxygen-acetylene tanks, a moderate small size nozzle and a strip of aluminum sheet about one-half inch wide, cut from a panel of the same thickness and character as the sheet forming the panel and the insert. This strip of aluminum is used in the same manner as solder. No acid is used, but the parts are cleaned with a file or emery cloth. The end of the soldering strip is warmed with the torch and dipped into the aluminum flux. This operation is repeated until the flux adheres to the end of the strip. The work of welding is rapidly performed by melting the fluxed end of the aluminum strip with the torch until the space between the insert and the panel is bridged and the two become one. A good welder working quickly will not add much thickness at the weld or allow the heat to be stationary long enough to distort the metal surface. These defects will be noticeable to some extent, of course, but if it is possible to use a hammer, most roughness can be leveled up and the file will do the rest.

Solder cannot be used to fill the uneven places as with steel. All leveling must be done by the file and hammer. Therefore, the aluminum welding operation must be done very carefully, since only a limited amount of filing can be done; in fact, the original break is often due to filing the sheet too thin in an attempt to level the panel. In this way the strength is greatly decreased and the least strain causes a rupture.

Difficult Repairs

When the weld has to be made over part of the wood framing, there is no chance to get at the under side to bring up dents or depressions. In such cases the leveling can be accomplished by inserting a thin strip of steel between the wood and the metal. By rubbing with this thin strip, the low points and depressions will be forced up.

Another method is shown in Fig. 3. Here a part of the panel is dented down over the framing. The illustration shows a counterbore from the under side of the wood. This should go about half way through; then, with a flat-end punch, the wood forming the bottom of the hole can be forced up. The wood will then rise over quite a large area and raise the panel evenly for quite a distance around the hole.

The welding operation described above is not novel,

nor has it any features that will attract the attention of the man who is working in some of the large shops where this work is going on every day. Considering the number of shops interested in bodies, knowledge in respect to properly repairing panel breaks is not very large. Even some well-equipped repair shops are not sure of the best methods of making repairs on a broken aluminum panel. Just to be able to know that it can be successfully done is a matter of no small importance. It can be successfully carried out by the ordinary good workman who has had experience with welding. A good aluminum weld will be just as strong as any other part of the sheet.

Every repair shop is equipped with a welding outfit. The flux, of which there are several makes on the market, is easily obtained, and with a little patience at the start this work can be done on any part of the body with confidence that the result will be satisfactory.

When a break occurs it is necessary to make sure that there are not inherent weaknesses or unnecessary strains in the frame that will cause the metal to break again at the same place. The very fact that a break has occurred should indicate the necessity of making doubly sure by adding some reinforcement in the shape of a plate or corner iron.

If, however, the break has occurred because the original panel was filed too thin, then the matter of reinforcement need not be considered.

Strains concentrate on the body at certain points, such as the bottom of the doorway, the corners of the opening on the rear compartment on roadsters and coupes or the small doors into the rear compartment on the side of roadster

bodies. Whenever possible, a vee should be cut across to allow the panel to weave slightly without crumpling. A vee is the safest where moldings butt and there is thickness to each piece; in fact, a vee should always be used if the length and location will not make it look unsightly.

Cautions

One bit of caution should be given about the use of asbestos fiber on the panels when welding. In theory this is the ideal way to curtail the space within which the heat will operate and thus protect the general surface of the panel. But it has to be used with caution, because, when applied, more heat has to be used at the weld than if no asbestos were used. Therefore, there will be a tendency to use so much heat at the welded spot that the metal becomes fluid and consequently quite a large spot may fall away entirely.

This has been discovered in shop practice also with regard to the use of cast iron forms. When welding was first practised on aluminum sheets, cast iron forms were used to draw the heat away from the sheet and keep it more nearly level during the work. It has been found, however, that better and quicker work can be done without any agency to assist the sheet in cooling. When the heat is drawn away, the amount of flame needed to make a weld is much greater. Consequently, the sheet often will flow before the weld is made. The asbestos will do the same as the iron form. Therefore, unless it is needed to protect the wood frame or keep the paint surface protected, it is best to dispense with the use of anything that will cool the panel.

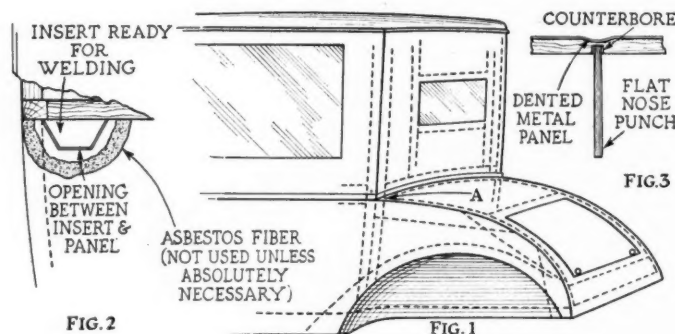


FIG. 2

FIG. 1

FIG. 3

Relation Between Factory Service and Engineering Departments

Perfect cooperation and accord is not always secured between the factory service and engineering departments. The subject is treated by an engineer and by a service manager in the two articles following. Each one presents his point of view in a forceful and interesting manner.

I. By B. B. Bachman*

II. By E. V. Rippingille*

I

IN preparing this paper for you, I found myself, first of all, at a loss for a title which might in some degree serve as a text around which I might build my subject.

It may be well in starting to arrive at some definitions so you may know what I have in mind when using certain terms. I do not ask you to accept these definitions as complete, as they relate to complex things about which our ideas are changing as new conditions arise and experience gives us a broader viewpoint.

The first thing I will try to define is service. Of all the abused phrases which fall from our lips with ill-considered glibness, the majority will contain either the word **service** or co-operation. They sound well, and we love to roll them under our tongues and taste their sweetness. But what is service? As I can see it, service is that which, being exercised by the individual or associations, obtains good will.

Service is, therefore, honest because the one who would render it to obtain good will cannot succeed if he seeks to take advantage by wilful misrepresentation of those with whom he is dealing. Service is also just, for if by chance misrepresentation has been made, or if full value has not been given for the consideration received, then service demands that these things be corrected. On the other hand, if the buyer wilfully attempts to take advantage of the frankness and honesty which characterize service, then justice demands that such claims be refused.

This definition is too broad for our purpose, however, for it goes back to the character of the individual or individuals responsible for the policies of the business, and is manifest in every activity of the business. Service, as I would define it for use in this paper, is the function of the Service Department, and this department in our business is charged with the establishment of repair stations, with adequate equipment, personnel and stock, in such locations as to insure our customers having access to facilities which will be capable of supplying their needs in the proper maintenance of their equipment at a fair cost if they wish to use them.

Engineering is also a broad term. It has been defined as the utilization of forces and materials in the development of the products and services of industry. Such a

definition embraces the entire activities of the race. Again I would, for our immediate use, restrict the definition of engineering to the functions of the Engineering Department, which is charged with the creation of designs, the furnishing of drawings and specifications to the Production Department by means of which these designs may be translated into the finished product, and the preparation of such technical information as may be required by the Sales Department in sales and application of the product, and by the Service Department in the adjustment and repair of the product as well as instructing the owner in these things.

In discharging the first function, the creation of designs, the Engineering Department must provide itself with men having the requisite training in technical theory and the practical experience in production and operation, which will enable them to view the result of their work as an article of commerce and utility. There must also be provided equipment for analysis and testing of materials and structures to prove their fitness and the degree of success with which they function.

In addition to this, a successful design can result only from a sympathetic consideration of problems of sales, production and maintenance. Probably no design can ever be called complete. Changing conditions of use, new and more efficient methods of production, new materials, weaknesses which seem to develop only under the strain of actual operation and features of construction which hamper and make for expensive repair operations are continually coming up, and these call for changes.

No matter how broad a viewpoint the Engineering Department may have, it cannot hope to contain within itself the sources of information which will enable it to understand thoroughly all these different factors. Therefore, it becomes necessary to consult with the Sales Department with regard to uses, markets, etc., with the Production Department regarding equipment available, methods to be used and their relation to the form which the various parts shall take, and with the Service Department on the manner in which the apparatus functions, where weaknesses are apparent and where improvement should be made to increase efficiency, lengthen life and secure greater simplicity and accessibility to make maintenance cheaper.

Now that we have arrived at a definition of the Service and Engineering Departments, together with a conception of their relative positions in an organization, we can proceed to consider the relation which they bear to each other and how they should work together.

*Mr. Bachman is engineer for the Autocar Co. and Mr. Rippingille is service manager for Hudson Motor Car Co. These papers were read at the recent N. A. C. C. Service Managers' Convention.

From what I have said you will understand it is my belief that the Engineering Department must depend upon field reports for information which will enable it to satisfactorily solve many problems. In order that this information shall be authoritative and of the greatest value, it should be complete and accurate. Gross defects in design, material or workmanship will be brought to light even if there is no organization to collect data by the complaints of the user, but such conditions should not exist if the Engineering Department is properly efficient. The art of motor vehicle design and construction has passed the days when, due to lack of engineering data, errors of this sort should occur.

For the more difficult task of closely observing operation, for the minute study of repair work to observe evidences of little things which, by their frequent recurrence in a large volume of cars in operation, become serious, and the scrutiny of operation to determine those features of design which cause unnecessary expense, an experienced and efficient organization must exist and it must function with proper methods.

Most men do their best only when spurred to do their best, and one of the most efficient spurs is criticism. I mean by this, criticism which arises out of an opinion supported by an understanding of the subject which can be obtained only by study. Only too often criticism is the result of unfounded prejudice, although I am frank to admit that prejudice is not always the attribute of the critic alone.

We hear the word "constructive" linked with criticism many times, and too often this is interpreted to mean that with the criticism should come a suggested remedy. I do not believe that this is essential; and certainly in the case which we are considering, criticism should not be withheld because it is not supported by a means of cure. This is the Engineering Department's job.

The thing the Engineering Department wants to know quickly is the effect; if the cause can be given at the same time, so much better. If a means of curing the trouble can be suggested, either in form or principle, better yet; but if the effect only can be reported, give us that. If we have knowledge of the trouble, we ought to have the ability and means to find out what causes it and how to cure it. As a matter of fact, the Engineering Department is often hindered in corrective troubles because the deduction as to cause has been in error and a remedy is suggested and vigorously supported, with the result that if adopted no improvement is made, and if not adopted a more or less lengthy scrap ensues, till the means actually adopted is sold. Again, I must hasten to add that I am not taking the position that the engineer "can do no wrong."

On the other hand, in indicating wherein improvements can be made to facilitate repair work, it is highly desirable that suggested constructions be submitted, because no one should be better able to do this than the repair man. Naturally, other considerations which the repair man has not taken into account may make it impossible to incorporate such suggestions, but this is again the engineer's part of the job.

Another way in which these two departments can assist each other is in experimental and research work. I have stated above that laboratory and field engineering tests are not 100 per cent. It takes the hard bumps of actual service to put their ideas through the refiner's fire. It is certainly not good policy to let experimental features go out in quantity production. Therefore, by the assistance of a properly organized Service Department, these designs can be put into actual service in

the hands of and under the observation of those who have not creative pride to temper their critical viewpoint.

To do these things which I have suggested there must be a systematic method and a proper organization. I hold no brief for any system, nor for any particular form of organization, and am not going to bore you by attempting to outline either in detail, because if you have thought on the matter you probably would not agree with me, and, if you have not thought, anything I might say would be of little or no benefit.

In principle, however, the Service Department should be in charge of and have in its personnel some men with an engineering training and a sympathetic understanding of the functions and policies of the Engineering Department, in addition to the other qualifications which fit them for their work.

The Engineering Department, on its part, should be free from the professional limitations too often manifested in the intolerant attitude adopted toward the opinions of those who have the temerity to suggest that there may be other and better ways of doing things than they have advocated.

For the reason that the collection of the information, which I have indicated the Engineering Department wants, really partakes of the nature of technical data, it should be collected methodically and recorded accurately. This will naturally involve the use of standard forms, etc.

Stock inventory files should be followed to note the distribution of repair material with regard to kind, quantity, locality, service conditions, etc. For instance, engine parts may be affected by fuel and lubricants, which vary in different localities, or a part which will perform with entire satisfaction in one class of work will be inadequate in another.

Repair orders also afford a fruitful source of valuable information as to the character of work which is required. Study of the ratio of labor time to material used gives an index as to the accessibility of the design, as well as to a means of comparing the relative efficiency of methods employed by different shops.

Records kept of new designs and comparisons in performance with old forms to judge their value is another activity which, when carried on in a practical manner, is valuable. Naturally, it should be pointed out that these things can be done effectively and thoroughly with little red tape or fuss, or they can be so completely hide-bound in system as to result in little beside overhead.

A very important activity of the Service Department is education, in operation and in care, adjustment and maintenance. On new designs the information for use by them in this work must be furnished by the Engineering Department. From an ideal viewpoint, possibly, no design should need explanation; but though the automotive vehicle has traveled far, it is still a great way from such a state of perfection.

For this reason assembly and sub-assembly drawings, which will be intelligible to the repair man, should be prepared which will enable him to grasp the principles of construction, and, on being interpreted into his own and the user's language, used to build a defense against possible trouble which might result from lack of attention to some relatively slight detail.

You will probably recognize the fact that my views are predicated in large part on a homogeneous organization which can probably exist only where the manufacture, sales and service functions are carried on by

one organization. Where selling and service is handled by more or less independent dealers, other problems, no doubt, arise. With these, however, my experience gives no warrant for the attempt to say anything. My views are naturally colored strongly by my own experience and that of the company with which I am connected.

You may logically ask the question that in the organization with which I am connected do the Service and Engineering Departments function together in the matter above outlined. Answering this frankly, I would say that neither of us feel that we have reached a point of perfection; but with due allowance for the frailty of human natures, I am of the opinion that the relationship between the two departments is as near ideal as could be expected, and there is no question as to the existence of a completely co-operative relationship.

II

The subject of the relationship between the Engineering and Service Departments is idealistic to the extreme. In my humble opinion the only way to express it is "the implicit confidence of one department head in the other." Surely, such a relationship cannot be other than beneficial.

Let us assume that the definitions of "engineer" and "service manager" are understood according to our individual ideas, but with this exception, as far as the writer is concerned, the engineer must possess as near 100 per cent theory as possible, regardless of other qualifications—and the service manager as near 100 per cent practical knowledge as possible, regardless of the amount of theory. Co-operatively, two such individuals will absorb so much from one another that, unhindered by outside restrictions, the result on the product will be fundamentally perfect and universally practical. This, you will say, is the millennium.

So far we have considered the ideal. Let us now look at the practical side; for it must be realized that there are certain limitations imposed by the personalities involved in both departments.

Except in a general way, there can be no defined rules as to the extent and methods of co-operative effort between engineer and service manager because the nature of the functions of each vary directly with the design and cost of the car or truck. Obviously, the most simple design and the lesser cost will present the least problem as to the necessity for constant intercourse and detail consideration. Production will be on a big scale, hence periodic changes will be fewer. Facilities for observation of the merits of individual points in design will be greater; and the realization of possibilities for improvement will most always be ahead of production to a far greater degree than in an expensive small-volume product.

Contrast this with the \$5000-car class. Here service means a great deal more than the mere guarantee of usefulness. The equipment details and luxury of such a car call for more constant attention to the temperamental needs of the purchaser and the advice of the merchant or dealer. A more exacting demand for perfection in operation, colors, styles and numerous little things that less expensive cars rate as accessories are imminent at all times.

The executive of the Service Department occupied with such a car must be a "sales" engineer in every sense. Practical knowledge of the design, assembly, methods, repair and operation are the first essentials if such a man is to be looked upon as an authority in his line. That he must have executive ability and business acumen, together with a sound knowledge of the principles of marketing and distributing, both cars and repair

parts, goes without saying. To discuss these qualifications at a meeting of service managers is superfluous. But just now we are interested particularly in his relationship to the Engineering Department; hence it would seem that we should take time only to discuss the attributes necessary in order for him to accomplish the ideal relationship.

Given a man with the practical knowledge before mentioned, he must next have such a personality as to insure his being recognized as an authority within his own organization. This establishes confidence in his suggestions and advice regarding the product.

Now consider the second party—the engineer—with whom the service manager must collaborate. Such engineers are the least numerous of all the personnel in the automobile industry. Usually there is but one to every company—the few assistants attendant upon the engineer's duties counting for relatively little as far as actual design or changes are concerned. Engineers, by reason of their training and concentrated application to theory, are inclined to be temperamental; at least we are apt to think so. They are usually of a highly analytical nature and far more attentive to detail than the practical man. They have a disconcerting way of asking questions.

We must appreciate, however, that it is only through such minute analysis and consideration that real improvements are created; the absence of such a trait of character would exclude the engineer's right to his title. How many failures have come about through too much experimentation without analytical consideration, and a lack of application of first principles?

My criticism of the service manager is that he is usually either too intolerant of theory or impatient at not being understood. Often it is the problem itself rather than the man who expounds it that is not understood. This, therefore, develops into a plea for more fundamental knowledge and a more thorough presentation of practical experiences to the engineer on the part of the service manager.

To bring this about it will be necessary for him to actually "know" what he is talking about at all times. Present your engineer with a definite statement and a carefully considered recommendation. Don't take the other fellow's word for anything—prove it. Only by this method can you establish a confidence in your ability and knowledge.

Meetings of service managers from different localities—not too many men at a time—for the purpose of discussing definite features and for obtaining positive information should be encouraged. Let us not discount the importance of the ability of a practical man to keep cars running, despite owners' idiosyncrasies and inherent faults in design—for the latter always exist, say what you may and pay what you like. Such intercourse with the outside is good for the engineer; he will soon take an interest in your meetings when he discovers your purpose and the valuable, first-hand information to be gained. Don't be afraid that your engineer will learn too much of the practical side; that's impossible, because the very nature which made him elect to work with his head rather than his hands will place limitations upon him—unless he is one in a million.

Last, but not least, my advice is to make your contact a personal matter—the memorandum and the table of statistics attached is a cold way to confer on a subject of importance. Cultivate your man and don't be too formal; engineers are very human.

My plea to engineers is a small one—more tolerance for the man who has forgotten his text books

or who never saw them! Many times in my own experience I have seen a lecture in elementary mechanics, forcibly impressed, but delivered in a friendly way and in simple language, result in an agreement and harmony instead of an altercation and lack of respect for each other's ability. When the practical man and the theoretical man get together with the idea that each has the advantage over the

other, all progress stops. Intolerance has slowed up more than one organization.

Both engineer and service manager must be suited to the need of each individual organization. But in the latter one essential is paramount—as far as his relationship with engineering is concerned—the ability to hold his place as the recognized authority on what the public thinks of the excellence of his company's product.

An Automotive Steam Engine

AN automotive steam engine, which is said to be practical for all kinds of automotive use, has recently been developed in Detroit. It is of the eight-cylinder, reciprocating type, weighs approximately 160 lb., and is said to develop 72.8 b.hp. It is 12 in. high, 15 in. long overall, and 11 in. long over the heads and cylinders.

The engine is novel in that it has no base, crankcase or crankshaft. Neither has it connecting rods or flywheel. It is assembled without packing or gaskets and there are only eight bolts in the entire engine. Not a single bolt or screw is connected with any moving part. It operates both forward and reverse at the same speeds, having only two rotating valves. Another feature of the engine is a one lever control, which starts and stops the engine, and handles all speeds forward and reverse as well as neutral.

The cylinders of this particular engine are of $2\frac{1}{2}$ in. bore and the stroke is $2\frac{1}{2}$ in., but the engine can be made in any desired size. Power for the pistons is transmitted to the driving shaft through a power ring similar to the wobbling plate and in some unconventional internal combustion engines as well as in some steam engines. The difference between this power ring and others lies in its flexible construction. It is actuated by trunnions which fit into the notches provided in the cylinders, which encircle the power ring. Each trunnion has a brass ball on its end, which works through slots in the cylinder wall. The ball is so attached to the ring that it can move in any direction through an arc of approximately 3 deg. Steam is admitted to the cylinders through the rotating valves at either end of the engine. The intake and exhaust are so arranged that two opposite cylinders are idle at any one moment, while the two groups of three cylinders between

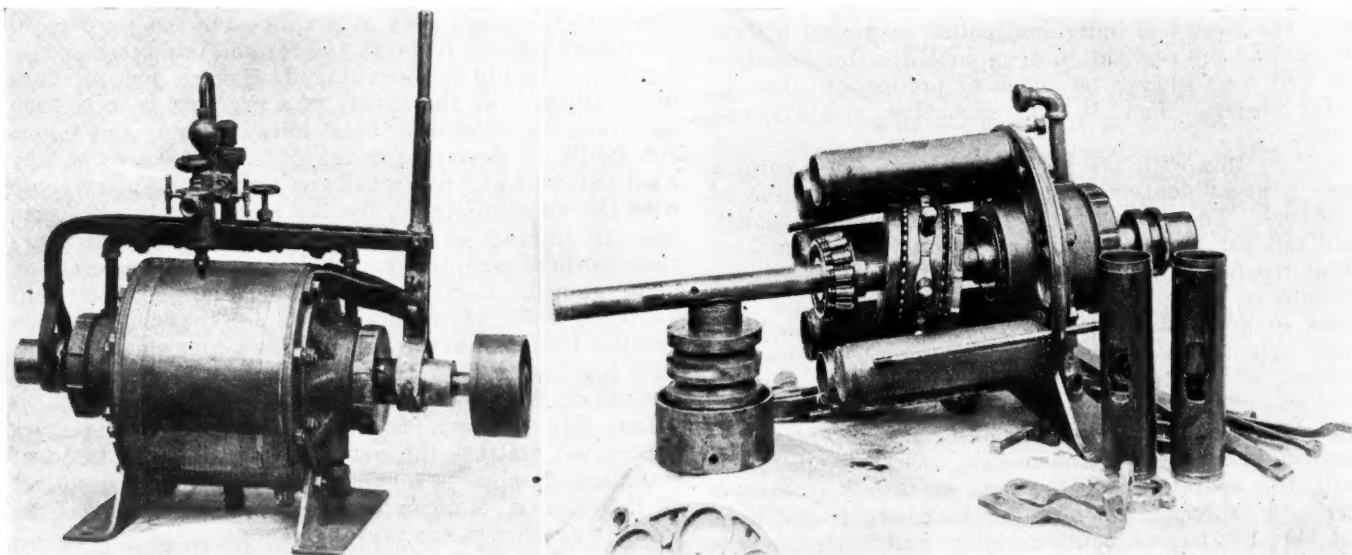
them are working in opposite directions. By this means a balanced power output is secured and end thrust on the roller bearing on the shaft is said to be eliminated. The engine is double acting and, according to the inventor, is virtually two engines in one. It is possible to use one end for an air compressor and the other for a steam engine, if desired.

The engine is the result of development which started in April, 1917, by the inventor, E. U. G. Reagan, and is to be built by the Superior Steam Engine Co. Mr. Reagan claims that development work on the engine is about complete.

Recent Aircraft Development in America

“WHATEVER has been achieved in American aeronautics during the last year has been due rather more to individual vision and courage than to general support.” This is a statement from the opening chapter of “The Aircraft Yearbook, 1921,” recently made up by the Manufacturers’ Aircraft Association and published by Small, Maynard & Co.

This new review indicates the need for a more sound aircraft program in this country, together with a more general support of constructive efforts toward aircraft development. The various aircraft achievements of the last year are recorded and discussed, including commercial airplane development, aerial transport, mail aircraft, aerial forest patrol, marine uses of aircraft, aerial photography, aircraft in news gathering, and other similar features.



Reagan steam engine, assembled and partially dismantled

Exports of Automobiles and Tires for June, 1921

| COUNTRIES | COMMERCIAL | | | | PASSENGER | | | | Parts | TIRES | | | All Other Tires |
|---------------------------------|---------------|-----------|---------|-----------|---------------|-------------|---------|-----------|-------------|-----------|----------|-----------|--------------------|
| | Complete Cars | | Chassis | | Complete Cars | | Chassis | | | Casings | Inner | Solid | |
| Europe | | | | | | | | | | | | | |
| Belgium..... | 1 | \$520 | 1 | ..... | 11 | \$17,792 | ..... | ..... | \$2,341 | \$5,264 | \$658 | ..... | ..... |
| Denmark..... | 1 | 1,711 | ..... | ..... | 12 | 24,670 | ..... | ..... | 30,554 | 40,726 | 1,146 | \$1,003 | \$552 |
| Finland..... | ..... | ..... | 1 | 1,000 | ..... | 783 | 2,523 | 438 | ..... | ..... | ..... | ..... | ..... |
| France..... | ..... | ..... | 27 | 71,903 | ..... | 19,874 | 61,923 | 215 | ..... | ..... | ..... | ..... | ..... |
| Germany..... | ..... | ..... | 3 | 2,485 | ..... | 425 | 290 | 29 | ..... | ..... | ..... | ..... | 22 |
| Greece..... | 5 | 2,598 | 39 | 16,887 | ..... | 18,361 | 9,640 | 807 | ..... | ..... | ..... | ..... | ..... |
| Iceland and Faroe Is..... | ..... | ..... | ..... | ..... | ..... | 3,105 | 44 | ..... | ..... | ..... | ..... | ..... | ..... |
| Italy..... | ..... | ..... | 2 | 1,750 | 1 | \$140 | 1,987 | 1,489 | ..... | ..... | ..... | ..... | ..... |
| Malta, Gozo, and Cyprus Is..... | ..... | ..... | 1 | 383 | ..... | 900 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Netherlands..... | 34 | 15,976 | 1 | \$2,100 | 57 | 49,503 | 1 | 4,782 | 6,529 | 6,473 | 310 | ..... | 720 |
| Norway..... | 1 | 1,802 | ..... | ..... | 4 | 3,675 | ..... | ..... | 6,945 | 4,775 | 176 | 935 | ..... |
| Poland and Danzig..... | ..... | ..... | 23 | 15,073 | 10 | 3,876 | 8,303 | 1,640 | 850 | ..... | ..... | ..... | ..... |
| Portugal..... | ..... | ..... | ..... | ..... | ..... | 1,482 | 430 | ..... | ..... | ..... | ..... | ..... | ..... |
| Roumania..... | ..... | ..... | 1 | 5,000 | ..... | 1,751 | ..... | 563 | ..... | ..... | ..... | ..... | ..... |
| Russia in Europe..... | ..... | ..... | 1 | 3,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Spain..... | ..... | ..... | 18 | 29,566 | 1 | 1,500 | 14,629 | 2,531 | 217 | 1,647 | ..... | ..... | ..... |
| Sweden..... | 5 | 3,225 | ..... | ..... | 58 | 53,347 | 7,224 | 4,020 | 1,037 | 2,534 | ..... | ..... | ..... |
| Switzerland..... | ..... | ..... | 8 | 13,438 | ..... | 2,080 | 1,242 | 60 | ..... | ..... | ..... | ..... | ..... |
| Turkey in Europe..... | ..... | ..... | 15 | 8,606 | ..... | 3,196 | 953 | 211 | ..... | ..... | ..... | ..... | ..... |
| England..... | ..... | 10 | 12,900 | 14 | 29,100 | 9 | 7,048 | 70,703 | 190,360 | 6,139 | 10,713 | 5,796 | ..... |
| Scotland..... | ..... | ..... | 1 | 500 | ..... | 532 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Ireland..... | ..... | ..... | 2 | 647 | ..... | 2,276 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Yugoslavia, Albania, etc..... | ..... | ..... | 2 | 3,388 | 5 | 2,791 | 196 | ..... | ..... | ..... | ..... | ..... | ..... |
| North and South America | | | | | | | | | | | | | |
| Bermuda..... | 2 | 4,571 | ..... | ..... | ..... | ..... | ..... | ..... | 281 | 188 | 41 | ..... | ..... |
| British Honduras..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Canada..... | 36 | 60,636 | 19 | 36,677 | 502 | 695,284 | 5 | 7,907 | 1,119,792 | 34,744 | 3,587 | 3,660 | 1,201 |
| Costa Rica..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 929 | 445 | 471 | ..... | ..... |
| Guatemala..... | ..... | ..... | 1 | 2,000 | ..... | 1,943 | 547 | 50 | 1,943 | 547 | 50 | 225 | 29 |
| Honduras..... | ..... | ..... | 2 | 4,500 | ..... | 1,732 | 1,074 | 79 | 1,732 | 1,074 | 79 | 1,242 | ..... |
| Nicaragua..... | ..... | ..... | ..... | ..... | ..... | 255 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Panama..... | 12 | 13,338 | ..... | ..... | 7 | 7,500 | 3 | 1,126 | 4,709 | 5,248 | 1,021 | 1,466 | 916 |
| Salvador..... | ..... | ..... | ..... | ..... | ..... | 1,132 | 2,627 | 23 | ..... | ..... | ..... | ..... | ..... |
| Mexico..... | 109 | 114,949 | 11 | 16,635 | 599 | 465,343 | 1 | 375 | 151,097 | 111,312 | 13,580 | 3,497 | 10,621 |
| Newfoundland and Labrador..... | ..... | ..... | 1 | 663 | ..... | 1,030 | 7,887 | 1,015 | ..... | ..... | ..... | ..... | 40 |
| Barbados..... | 1 | 700 | 1 | 500 | 3 | 3,965 | ..... | ..... | 969 | 1,468 | 405 | 206 | ..... |
| Jamaica..... | 3 | 1,584 | ..... | ..... | 9 | 3,567 | 2 | 890 | 14,054 | 9,055 | 771 | 8,518 | 425 |
| Trinidad and Tobago..... | 15 | 7,587 | 3 | 1,349 | 7 | 5,039 | ..... | ..... | 16,094 | 9,517 | 936 | 1,446 | 169 |
| Other British West Indies..... | ..... | ..... | 6 | 4,100 | ..... | 1,723 | 2,260 | 632 | 13 | 289 | ..... | ..... | ..... |
| Cuba..... | 14 | 8,105 | 8 | 33,263 | 56 | 59,181 | ..... | ..... | 321,678 | 33,047 | 7,557 | 16,968 | 338 |
| Virgin Islands of U. S..... | ..... | ..... | 2 | 1,002 | 2 | 651 | ..... | ..... | 1,895 | 412 | 121 | 949 | ..... |
| Dutch West Indies..... | 2 | 899 | ..... | ..... | ..... | ..... | ..... | ..... | 435 | 302 | ..... | ..... | ..... |
| French West Indies..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 828 | 221 | ..... | ..... | ..... |
| Haiti..... | ..... | ..... | 2 | 1,035 | ..... | ..... | ..... | ..... | 3,168 | 2,501 | 159 | ..... | ..... |
| Dominican Republic..... | 1 | 1,600 | ..... | ..... | 5 | 5,230 | ..... | ..... | 4,320 | 15,798 | 905 | 300 | ..... |
| Argentina..... | ..... | ..... | 4 | 11,393 | ..... | ..... | ..... | ..... | 11,074 | 7,365 | 464 | 619 | ..... |
| Bolivia..... | ..... | ..... | ..... | ..... | ..... | 1,082 | ..... | ..... | ..... | ..... | 304 | ..... | ..... |
| Brazil..... | ..... | ..... | ..... | ..... | ..... | 3,120 | ..... | ..... | ..... | ..... | ..... | 456 | ..... |
| Chile..... | 2 | 1,039 | ..... | ..... | 1 | 1,800 | ..... | ..... | 7,653 | 13,381 | 2,997 | ..... | ..... |
| Colombia..... | 2 | 4,875 | 3 | 1,300 | 3 | 3,354 | ..... | ..... | 2,897 | 1,100 | 301 | ..... | ..... |
| Ecuador..... | ..... | ..... | 1 | 1,000 | ..... | ..... | ..... | ..... | 2,101 | 2,839 | ..... | ..... | ..... |
| Falkland Islands..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 486 | ..... | ..... |
| British Guiana..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,897 | 2,433 | ..... | ..... | 45 |
| Dutch Guiana..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 143 | ..... | ..... | ..... | ..... |
| Peru..... | ..... | ..... | 3 | 12,214 | ..... | ..... | ..... | ..... | 10,527 | 3,985 | 550 | 636 | ..... |
| Uruguay..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11,151 | 2,721 | 356 | ..... | ..... |
| Venezuela..... | ..... | ..... | 18 | 19,044 | ..... | ..... | ..... | ..... | 9,047 | 6,284 | 659 | 49 | 592 |
| Asia | | | | | | | | | | | | | |
| Aden..... | ..... | ..... | 3 | 2,830 | ..... | ..... | ..... | ..... | 401 | ..... | ..... | ..... | ..... |
| China..... | ..... | ..... | 3 | 3,765 | 40 | 47,216 | 10 | 4,300 | 8,811 | 22,303 | 294 | ..... | ..... |
| Chosen..... | ..... | ..... | ..... | ..... | ..... | 4,167 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| British India..... | 8 | 20,850 | 3 | 6,662 | 40 | 72,065 | ..... | ..... | 28,284 | 2,713 | 1,012 | 6,244 | ..... |
| Straits Settlements..... | ..... | ..... | 1 | 2,089 | ..... | 6,186 | 11,325 | 776 | 6,186 | 11,325 | 776 | 6,256 | ..... |
| Other British East Indies..... | ..... | ..... | ..... | ..... | ..... | 417 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Dutch East Indies..... | ..... | ..... | 10 | 29,390 | 3 | 4,500 | ..... | ..... | 26,514 | 17,038 | 1,692 | 23,576 | 300 |
| French Indo China..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 315 | ..... | ..... | ..... | ..... |
| Hongkong..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,429 | 1,957 | 115 | ..... | ..... |
| Japan..... | 18 | 32,780 | 50 | 25,980 | 83 | 59,580 | 52 | 26,299 | 35,132 | 20,923 | 853 | 6,666 | 1,015 |
| Siam..... | ..... | ..... | ..... | ..... | ..... | 149 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Turkey in Asia..... | 1 | 615 | 1 | 3,000 | 19 | 15,231 | 15 | 17,800 | 11,279 | 5,348 | 516 | 1,572 | ..... |
| Australia..... | ..... | ..... | 3 | 9,939 | 22 | 32,986 | 23 | 26,239 | 109,886 | 1,799 | 575 | 2,329 | ..... |
| New Zealand..... | ..... | ..... | 10 | 27,000 | 11 | 13,268 | ..... | ..... | 13,504 | 25,177 | 376 | 1,365 | ..... |
| Other British Oceania..... | ..... | ..... | 2 | 2,148 | ..... | 385 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| French Oceania..... | ..... | ..... | 1 | 1,844 | ..... | ..... | ..... | ..... | 337 | 1,210 | 166 | 1,220 | ..... |
| Other Oceania..... | ..... | ..... | 1 | 500 | ..... | ..... | ..... | ..... | 217 | 75 | 24 | ..... | ..... |
| Philippine Islands..... | ..... | ..... | 1 | 200 | 1 | 600 | ..... | ..... | 14,380 | 24,253 | 4,146 | 28,836 | 7,845 |
| Africa | | | | | | | | | | | | | |
| British West Africa..... | ..... | ..... | 6 | 17,354 | ..... | ..... | ..... | ..... | 7,774 | 1,888 | 863 | 540 | ..... |
| British South Africa..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 22,691 | 3,420 | ..... | ..... | ..... |
| British East Africa..... | ..... | ..... | 5 | 6,510 | ..... | 1,883 | 1,414 | 212 | ..... | ..... | ..... | ..... | ..... |
| Canary Islands..... | ..... | ..... | 10 | 3,762 | ..... | 3,799 | 761 | 344 | ..... | ..... | ..... | ..... | ..... |
| French Africa..... | ..... | ..... | 10 | 4,330 | ..... | 1,722 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Morocco..... | ..... | ..... | ..... | ..... | ..... | 79 | ..... | 572 | ..... | ..... | ..... | ..... | ..... |
| Egypt..... | ..... | ..... | 9 | 4,780 | 14 | 5,720 | ..... | ..... | 1,970 | 769 | 43 | ..... | ..... |
| Total..... | 273 | \$299,720 | 145 | \$231,514 | 1,810 | \$1,945,746 | 154 | \$111,744 | \$2,211,528 | \$758,518 | \$60,620 | \$138,015 | \$30,915 |

Taking Advantage of Changing Conditions in Foreign Market

Ford is reported to have organized to cover rich agricultural and mining territories in Peru. Other American manufacturers have recognized the possibilities of the developing market in South America. Road development and use of cars for utility is materially aiding sales growth.

By George E. Quisenberry*

A RECENT news note from Lima, Peru, reported that the Ford representative in that country had established branches and sub-agencies in a number of new cities and towns and that a dealer net was being organized to cover all the rich agricultural and mining territories of the Republic. The report further declared that Ford was apparently enlarging his dealer representation throughout other countries of Latin-America in an effort to take his cars, trucks and tractors into every section that offered any sales possibilities.

This brief notice may be interpreted as recording the opening of a new phase in the foreign sales of automotive equipment. A few years ago the American automobile was little known outside of the United States and particularly in those great territories of the various continents which had depended upon Europe for their automobiles and their automotive equipment. But the war stopped the European exports and the small automotive trade of these countries perforce sought the United States. This small trade was almost entirely a city business—the automobile was considered only as a pleasure vehicle, to be used solely by the rich and as a badge of the owner's social status.

The pioneer American exporters of automotive equipment had, of course, a different viewpoint. Theirs was a vision of the essential automobile, built and sold by production methods, and useful alike in the cities and the country districts. This thought took hold slowly and spread gradually, but the after-war demand prevented its realization to the fullest extent. So far as this is concerned, it may be said that sales were made during 1919 and most of 1920 without any rhyme or reason. It was a period of extravagant buying for every kind of product and one in which the normal course of development mattered little, either to the buyer or to the seller.

This period, of course, is definitely passed. Undoubtedly, it should be said, happily past and never to return. What we may look for in the future is an export trade built soundly upon essential needs and essential reasons, a trade that, when all is said and done, will be more satisfactory, more valuable, more permanent and of greater volume than any of the past. The country sections will be more closely covered, the automobile will be used for essential purposes and the motorization of all sections will develop fully.

This will be the second phase of automotive exporting. Some companies, notably Ford, already have seen it and are reaching out with all the ability and honesty that characterizes the best of American business. Many companies have not begun to sense it, while others perhaps never will. Those of the first category are going after this coming trade with all their resources—and they are

making shipments now to all parts of the world. The companies of the second class are awakening to the potential business and indicate that they are about to get back into the foreign field and go aggressively after business. The remainder, of course, are not worth worrying about, except as they will make sporadic sales from time to time, without providing service, that will reflect discredit upon the rest of the industry.

To go more into the proof. Although of a localized character, it may be taken to be general in its interpretation and will point out a condition that is becoming world-wide.

The proof refers to Chile. This southern Republic has been hard hit by the financial depression. Its currency has depreciated to an extent that causes the ordinary exporter to "quit cold." But, fortunately, all the exporters of American automotive equipment are not "ordinary"; many of them are tremendously alive and are carrying on with a vision that sees beyond conditions of the moment.

Chile held its first automobile show at Santiago, the capital, from May 20 to June 5. Although promoted by a private company, all makes of cars represented in Santiago were shown except a few, the agents of which are being changed. The exhibition was held in the center of the city, in a handsomely decorated building, and so successful was it that an annual show will be held hereafter, probably during the month of March.

The significant factor is this, which is quoted verbatim from the report sent from Santiago by the show committee:

"While statistical figures referring to imports show a considerable reduction in automotive products, based on our deep knowledge of the market, we can confidently state that this situation is only momentarily upset. We must remember that all automotive progress in Chile has been accomplished in spite of the lack of good roads. Just a few days before the formal opening of the show the Highway Law was passed. This calls for extensive road construction throughout the country.

"This will undoubtedly mark a new era for the motor car in Chile. The automobile which has been a vehicle of luxury and recreation will become an object of practical utility and of absolute necessity. The importance of the automobile is a fact that can be readily understood by considering the topographical conditions of our country. To this dominating factor we must add lack of sufficient rail transportation and continuous freight congestion. The automobile, we repeat, is a factor absolutely essential to our national life."

Apply that factor of absolute essentiality to all parts of Latin-America, to South Africa, to Australasia, to Asia, and to the other automotive markets, and the future cannot

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be misunderstood. The "new era" will not be confined to Chile, it is spreading into Argentina, Peru, Brazil, Colombia and Venezuela, Mexico, India, China, the Far East and every developing territory of the world.

More road building is under way to-day in China, it is reported, than for many years, and letters from personal friends in the treaty ports say traders and business men see unprecedented prosperity just around the corner. New highway activity that means the expenditure of thousands of pounds sterling has been commenced in New South Wales and other parts of the Australian group. Nearer home, the state of Sao Paulo, Brazil, is leading the way to highway betterment. To the fine road from Santos to the capital has been added an equally fine stretch of 110 kilometers in length from Sao Paulo to Campinas and work is progressing on the highway from Sao Paulo to Itu, something more than 150 kilometers. These are all macadam highways and the review does not consider other inland roads which are reported to be in good shape, notably from the capital to Ribeirao Preto, a distance of 440 kilometers. "At the present time our Government is displaying unusual activity in road work," a dealer from Sao Paulo writes.

Venezuela has undertaken a program of highway building that is showing more results than is generally accredited. Panama, for instance, has just let new road contracts totalling \$270,000, the third project to be under-

taken this year, all the work of which is in the territory of the Republic and none of which is in the Canal Zone. The city of Santo Domingo, in the Dominican Republic, has decided to seek a loan of \$500,000 for public work, much of which will be for paving the principal streets. The activities in Mexico are better known and roads are being constructed in Cuba despite the present difficulties. Argentina, likewise, is displaying more activity than in previous years and a goodly number of long distance automobile tours and races, together with increased utility of the automobile, has this year added to the consciousness of road necessity.

Automotive exporters, in common with those of other lines, feel more optimism to-day than they have since the readjustment began. With Hoover they believe the corner has been turned and the future will witness a gradual but none the less certain restoration of normal business that will be re-enforced greatly by the growing understanding of the essentiality and utility of the automobile.

Ford is getting in on the ground floor in Peru. His foreign department apparently is going after the rural trade. It has realized that there are other cities and towns in each of the foreign territories than the capital or the chief port. A man does not have to live in Lima to own an automobile; he can use it just as well in Trujillo, Ica, Chincha or any of the other towns that dot the rich agricultural and mining areas.

Home-Made Fuel for South Africa

THE production of a home-made fuel for automotive vehicles is contemplated in South Africa, according to reports from Trade Commissioner Stevenson of Johannesburg to the Bureau of Foreign and Domestic Commerce. The new fuel, which has been patented in the Union under the name of Penrol, will be made principally of alcohol, which will be produced from locally grown maize or corn. A company is being formed to produce and market the fuel and it is claimed that all ingredients can be produced locally. The selling price is to be considerably less than that of gasoline; it has no smell and it does not carbonize, although it is claimed to be equal to gasoline in power. The report declares that it has been subjected to experiments for a considerable period in passenger cars, motorcycles, trucks and airplanes with excellent results. The gasoline consumption of the Union is estimated at 12,000,000 gal. annually.

Suggestions for British Trade

A writer in the (weekly) Trade Supplement of the London Times makes a notable admission regarding the strong position of American cars in markets which, he, in common with other writers in British organs, regards as eminently suited for British interests, or, in many cases, as though Great Britain had some special and prescriptive right to them.

This later view of the situation is largely traceable to the no longer applicable saying that "Trade follows the Flag," for from a variety of circumstances it is not true to argue that the colonizing influence extends far beyond the immediate purview of the first in-comers.

However, here are a few excerpts from the writer's fair statement of the case through the Times: "It must be remembered that the American vehicle has obtained a firm footing and standardized opinion as to the capacity of a car. Where there are, say 30 American cars to one British, it would be wrong to assume that local opinion is that American cars are cheap and powerful. The opinion is that British cars are far too dear, have

too much finish, and require too much "driving"—i.e., gear-changing—for local conditions.

"There is a little doubt that the British Empire would supply a valuable market for British engineers, if they are willing to design a special overseas model.

"The technical requirements are strikingly simple and almost universal for overseas markets. The track should be the standard, viz.: 4 ft. 8 in. The clearance should be never less than 10 in., and more in the case of cars of long wheelbase. The cars should be capable of good top-gear performance, and this means a large engine and low gearing.

"The finish should be sufficient and not excessive. That means that imitation leather should not be used, but that less varnish than usual is an advantage. As to body work, the Empire is preparing to look after itself in the matter and exporters to Australia and Canada are well advised not to undertake the risk and cost of supplying British bodies unless specially required."

Tractors in South Africa

The British Trade Commissioner at Cape Town has sent a report on the working of farm tractors in South Africa, which incidentally gives some useful hints.

High altitudes affect adversely the power output of internal combustion engined tractors by as much as 10 per cent at 4000 ft. Engines, therefore, must have a fair surplus of power for the stipulated load; must be sturdy and their shaft-speed should not exceed 600 r.p.m. and certainly not more than 1000 r.p.m.

Tractors and tractor ploughs must be capable of tackling land ploughed ordinarily by local oxen. Such land is hard after a drought, becomes dusty and little of it is easily broken.

Skilled labor for tractors and tractor implements is not usually available.

A cheap lubricant is essential.

Generally the tractor required must be as near fool-proof as possible.

Weights of 1921 Cars on Which Kansas Bases License Fee

Comparison of sedan and touring car shows that for 75 makes the average excess of the closed car is 362 pounds, the maximum difference being 655 and the lowest 200 pounds. Heaviest car in this record was a 1914 model brougham, weight 6200. Ford the lightest car listed.

HOW much should the weight of a sedan exceed that of a touring car? This and other interesting questions regarding the weight of the various makes and styles of automobiles have frequently been asked, but answers were impractical because weight data has been almost impossible to obtain.

Beginning in July, automobile licenses in Kansas are based on weight. The Secretary of State, upon whom the enforcement of the law was placed, asked all factories to supply him with the shipping weight of all styles of cars. In some cases this information was not supplied to him. His procedure in these cases was to weigh a car of the make and style desired when it was presented for licenses, and to deduct 100 lb. as an allowance for fuel, oil and extra equipment. This compilation of weights has been printed as a guide for those concerned with the issuance of licenses.

A study of this list is interesting. In the main, the weights increased slightly from 1912 to 1914, but since that year there has been a tendency to lighter cars. There are exceptions, of course, but chiefly the exceptions represent an increased number of cylinders and a larger car generally. In some cases the greater number of cylinders and increased wheelbase appears to have been accomplished without material increase in weight.

The heaviest car in this record is a brougham built in 1914, which weighed 6200 lb. The lightest car is the most numerous one.

It is quite interesting to note the difference of weight between the various styles of cars of the same make for 1921. The lowest added weight over the touring car for a sedan is 200 lb. The greatest is 655. The average of 75 makes of cars is 362 lb. The following weights for 1921 cars is taken from the Kansas compilation:

| Allen | | | Chandler | | | Dixie Flyer | | | Franklin | | |
|-------|-------------------------|--------|----------|-----------------------|--------|-------------|---------------------|--------|----------|-------------------|--------|
| Model | Style | Weight | Model | Style | Weight | Model | Style | Weight | Model | Style | Weight |
| M-43 | Roadster | 2,500 | N-S | 7-pass. touring | 2,985 | H | Touring | 2,650 | S-9B | Touring | 2,430 |
| M-43 | Touring | 2,500 | N-S | 4-pass. roadster | 2,985 | H | Roadster | 2,550 | | Sedan | 2,755 |
| M-43 | Sedan | 2,825 | N-S | 2-pass. roadster | 2,985 | H | Sedan | 2,950 | | Brougham | 2,705 |
| M-43 | Artcraft | 2,594 | N-S | Dispatch | 2,985 | | | | | 4-pass. | 2,435 |
| | | | N-S | Sedan | 3,400 | | Dodge | | | 2-pass. | 2,305 |
| | Anderson | | N-S | Coupe | 3,230 | 30 | Roadster | 2,225 | | Demi-sedan | 2,537 |
| 8-21 | Sportster | 3,555 | N-S | Limousine | 3,430 | 30 | Touring | 2,490 | | Demi-coupe | 2,442 |
| 8-21 | 7-pass touring | 3,600 | | | | 30 | Coupe | 2,520 | | Club sedan | 2,755 |
| 8-21 | 4-pass. anniv. tourster | 3,750 | | Chevrolet | | | Sedan | 3,045 | | | |
| 8-21 | 7-pass. anniv. touring | 3,825 | 4-90 | Touring | 1,900 | | | | | Friend | |
| 8-21 | 4-pass. sedanette | 3,925 | 4-90 | Roadster | 1,820 | | | | | Touring | 2,430 |
| 8-21 | 7-pass. sedan | 3,925 | 4-90 | Sedan | 2,160 | M-17 | Touring | 2,397 | | Roadster | 2,400 |
| | | | FB-50 | Coupe | 2,040 | M-12 | Roadster | 2,305 | | Coupe | 2,650 |
| | | | FB-20 | Touring | 2,745 | M-17S | Sedan | 2,709 | | Gardner | |
| | | | FB-30 | Roadster | 2,640 | M-12C | Coupe | 2,520 | | Touring | 2,370 |
| | | | FB-40 | Coupe | 2,818 | | | | | Roadster | 2,320 |
| | Auburn | | | Sedan | 2,947 | | | | | Sedan | 2,735 |
| 6-39H | Touring | 2,950 | | Cleveland | | | | | | | |
| 6-39K | Roadster | 2,885 | | | | D-4 | Touring | 2,790 | | Grant | |
| 6-39 | Townster | 2,940 | | | | D-6 | Touring | 2,910 | HX | Roadster | 2,625 |
| 6-39 | Coupe | 3,195 | | | | H-4 | Sportster | 2,760 | HX | Touring | 2,725 |
| 6-39 | Sedan | 3,245 | | | | H-6 | Sportster | 2,880 | HX | Sedan | 3,000 |
| | Briscoe | | | | | K-6 | Coupe | 3,145 | HX | Coupe | 2,900 |
| 4-34 | Touring | 2,225 | | Cole | | G-6 | Sedan | 3,175 | | | |
| 4-34 | Roadster | 2,180 | | | | | Elgin | | | Haynes | |
| 4-34 | Sedan | 2,465 | 870 | Touring | 3,590 | All | | | 47 | 7-pass. touring | 3,600 |
| 4-34 | Coupe | 2,390 | 870A | Tour. with perm. top | 3,740 | Models | Touring | 2,600 | 47 | Tourister | 3,550 |
| | | | 871 | Roadster | 3,320 | | Scout | 2,650 | 47 | Speedster | 3,550 |
| | Buick | | 872 | Sportster | 3,440 | | Sedan | 2,950 | 47 | Brougham | 3,800 |
| 44-6 | Roadster | 2,980 | 872A | Sport. with perm. top | 3,590 | | Coupe | 2,840 | 47 | Suburban | 4,100 |
| 45 | 5-pass touring | 3,120 | | | | | | | 48 | 7-pass. touring | 3,800 |
| 46 | 3-pass. coupe | 3,285 | | | | | Essex | | 48 | Tourister | 3,750 |
| 47 | 5-pass. sedan | 3,545 | 878 | Sportsdean | 3,890 | All | | | 48 | Speedster | 3,750 |
| 48 | 5-pass. coupe | 3,545 | 879 | Sportosine | 4,000 | Models | Phaeton, L. H. D. | 2,560 | 48 | Brougham | 4,150 |
| 49 | 4-pass. coupe | 3,420 | 879A | Sportosine | 4,000 | | Phaeton, R. H. D. | 2,560 | 48 | Suburban | 4,350 |
| 49 | 7-pass. touring | 3,420 | 883 | Tourosine | 3,680 | | Roadster, L. H. D. | 2,545 | | | |
| 50 | 7-pass. sedan | 3,760 | 884 | Tourosine | 4,130 | | Roadster, R. H. D. | 2,545 | | Hudson** | |
| | | | 885 | Toursedan | 4,090 | | Cabriolet, L. H. D. | 2,675 | | 7-pass. phaeton | 3,575 |
| | Cadillac | | | | | | Cabriolet, R. H. D. | 2,675 | | 4-pass. phaeton | 3,405 |
| 59 | 7-touring | 4,050 | | Crow-Elkhart | | | Sedan, L. H. D. | 2,900 | | Sedan | 3,815 |
| 59 | 2-roadster | 3,800 | | | | | Sedan, R. H. D. | 2,900 | | Coupe | 3,620 |
| 59 | 4-phaeton | 3,800 | L-53 | Roadster | 2,575 | | Chassis, L. H. D. | 1,910 | | Touring limousine | 3,840 |
| 59 | 5-imperial | | L-54 | Sport | 2,575 | | Chassis, R. H. D. | 1,910 | | Cabriolet | 3,550 |
| 59 | limousine | 4,450 | L-55 | Touring | 2,575 | | | | | Limousine | 3,860 |
| 59 | 5-limousine | 4,400 | S-63 | Roadster | 2,690 | | Ford* | | | Chassis | 2,690 |
| 59 | 4-sedan | 4,150 | S-64 | Sport | 2,690 | | | | | Hupmobile* | |
| 59 | 7-suburban | 4,350 | S-65 | Touring | 2,690 | Touring | Touring | 1,500 | R | 5-pass. touring | 2,470 |
| 59 | 4-victoria | 4,050 | S-67 | Sedan | 3,075 | Runabout | 1,400 | | RR | Roadster | 2,375 |
| 59 | 5-town brougham | 4,350 | | | | Sedan | 1,725 | | RQ | Sedan | 2,910 |
| | | | | Cunningham | | Coupe | 1,525 | | RK | Coupe | 2,710 |
| | | | V | Touring | 4,400 | | | | | | |
| | Case | | | | | | | | | Jackson | |
| V-20 | Touring | 3,540 | | | | | | | | Touring | 3,000 |
| V-20 | Sport | 3,410 | | | | | | | | Semisport | 3,200 |
| V-20 | Coupe | 3,650 | 51 | Touring | 2,900 | | | | | Sport | 3,300 |
| V-20 | Sedan | 3,800 | 52 | Sport | 2,900 | | | | | Cal. special | 3,320 |
| | | | 53 | Special sport | 2,900 | | | | | Coupe | 3,545 |
| | Chalmers* | | 54 | Sedan | 3,400 | | | | | Sedan | 3,525 |
| 6-30 | 5-touring | 2,890 | 55 | Coupe | 3,400 | | | | | Touring | 2,400 |
| 6-30 | Sport | 2,900 | 56 | Roadster | 2,900 | | | | | | |
| 6-30 | Coupe | 3,075 | 57 | Special roadster | 2,900 | | | | | | |

When equipped with starter add 90 pounds.

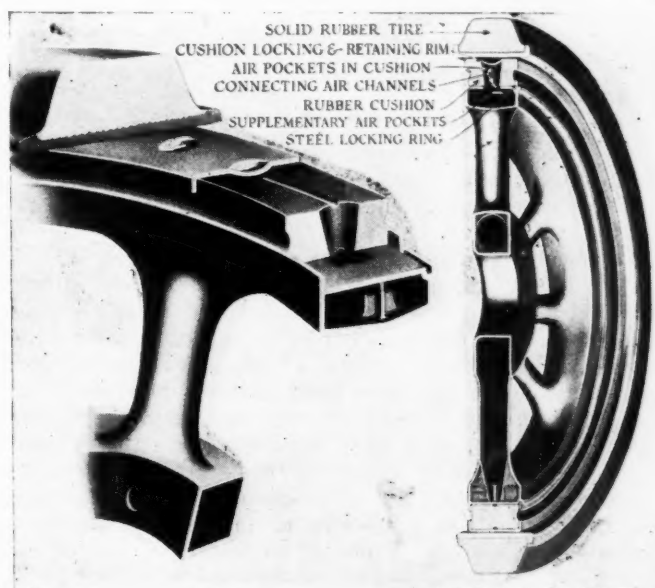
When equipped with demountable rims and tire carrier add 45 pounds.

All models and styles less than 2,000 pounds.

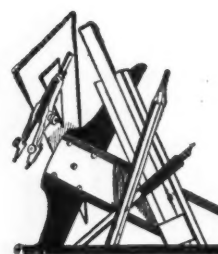
| Jordan | | | Model | Style | Weight | | | | Model | Style | Weight | | | | Model | Style | Weight | |
|------------|-------------------|-------|---|-----------------|-------------------------|-------|--|--|----------|---------------------------|----------------------|-------|--|-------------------|--------------|--|---|-------|
| M | Roadster | 2,700 | Master | Touring | 2,750 | | | | | 4-5-pass. duplex coupe | 4,580 | | | | B-41 | Sedan | 2,910 | |
| M | Landulet road. | 3,100 | Master | Six | | | | | | 7-pass. duplex sedan | 4,670 | | | | B-42 | Coupe | 2,600 | |
| M | Sedan | 3,100 | Master | Sedan | 3,100 | | | | | Packard Single Six | | | | | | Seneca | | |
| M | Brougham | 3,075 | Master | Coupe | 3,000 | | | | | 5-pass. touring | 2,920 | | | | | 5-pass. touring | 2,180 | |
| M | 5-touring | 2,850 | Six | | | | | | | 2-pass. runabout | 2,790 | | | | | 4-pass. roadster | 2,180 | |
| F | 7-touring | 3,200 | | Mitchell | | | | | | 5-pass. sedan | 3,170 | | | | J | 2-pass. roadster | 2,180 | |
| | King | | | F-3-40 | Roadster | 3,000 | | | | | 4-pass. coupe | 2,990 | | | | | Standard | |
| | Touring | 3,390 | | F-4-40 | Sport | 3,250 | | | | | Paige | | | | | | Stanley* | |
| | Foursome | 3,400 | | F-5-40 | Touring | 3,000 | | | | | Touring | 2,910 | | | | 735A | 4-pass. touring | 3,800 |
| | Road King | 3,255 | | F-7-42 | Touring | 3,440 | | | | 44-6 | 3-pass. roadster | 2,910 | | | | 735B | 7-pass. touring | 3,900 |
| | Limoudan | 3,850 | | F-40 | Coupe | 3,400 | | | | 44-6 | 4-pass. roadster | 3,030 | | | | 735D | Sedan | 4,450 |
| | Kissel | | | F-40 | Sedan | 3,600 | | | | 44-6 | Coupe | 3,040 | | | | 735C | Coupe | 4,400 |
| C.B. six | 7-touring | 3,420 | | | Moline | | | | | 44-6 | Sedan | 3,235 | | | | | Stephens | |
| C.B. six | 4-tourster | 3,645 | R | Touring | 3,200 | | | | 44-6 | Touring | 3,540 | | | | 82 | Roadster | 3,140 | |
| C.B. six | 2-speedster | 3,645 | R | Sedan | 3,540 | | | | 66-6 | 5-pass. roadster | 3,475 | | | | 83 | Coupe | 3,300 | |
| C.B. six | Coupe | 3,810 | R | Coupe | 3,360 | | | | 66-6 | Coupe | 3,725 | | | | 84 | Touring | 3,235 | |
| C.B. six | Sedan | 4,010 | | | Monroe | | | | | 66-6 | Sedan | 3,985 | | | | 84-B | Touring | 3,265 |
| C.B. six | 4-sedan urban | 4,010 | S-9 | Touring | 2,360 | | | | 66-6 | | | | | | 85 | Sedan | 3,645 | |
| C.B. six | Coach sedan | 3,925 | S-10 | Roadster | 2,300 | | | | 6-50 | Paterson | | | | | 86 | Touring | 3,345 | |
| | Lexington | | S-11 | Sedan | 2,775 | | | | 6-50 | Touring | 3,050 | | | | 82 | Artcraft top | 3,215 | |
| 6-S-21 | Touring | 2,900 | S-12 | Coupe | 2,658 | | | | 6-50 | Sedan | 3,700 | | | | 84 | Artcraft top | 3,425 | |
| 6-S-21 | Coupe | 3,100 | | | Moon | | | | | 6-50 | Coupe | 3,600 | | | | 86 | Artcraft top | 3,460 |
| 6-S-21 | Lex. sedan | 3,100 | 6-48 | Touring | 2,925 | | | | | Peerless*** | | | | | 92-B | Roadster | 3,240 | |
| 6-S-21 | Sedanette | 3,100 | 6-48 | Roadster | 2,800 | | | | 56 | Touring | 3,830 | | | | | Stevens-Duryea | | |
| 6-S-21 | Thorobred | 2,900 | 6-48 | Coupe | 3,200 | | | | 56 | Roadster | 3,685 | | | | E | Touring | 4,600 | |
| 6-T-21 | Touring | 3,250 | 6-48 | Sedan | 3,200 | | | | 56 | Sedan | 4,175 | | | | E | Sport | 4,600 | |
| 6-T-21 | Salon sedan | 3,450 | 6-68 | Touring | 3,350 | | | | 56 | Coupe | 3,900 | | | | E | Limousine | 4,800 | |
| 6-T-21 | Sedanette | 3,450 | 6-68 | Sedan | 3,700 | | | | 56 | Limousine | 4,225 | | | | E | Sedan | 4,800 | |
| | Liberty* | | The models for 1920 and 1921 weights are based on wood or disteel wheel equipment. Deduct 50 pounds for wire-wheel equipment. | | | | | | | | | | | Studebaker | | | | |
| 10-C | Touring | 2,750 | 41 | Touring | 2,530 | | | | | Pierce-Arrow | | | | | EJ | Touring | 2,500 | |
| 10-C | Roadster | 2,600 | 42 | Roadster | 2,432 | | | | | 4-touring | 4,281 | | | | EJ | Sedan | 2,900 | |
| 10-C | Speedster | 2,650 | 43 | Coupe | 2,732 | | | | | 6-touring | 4,420 | | | | EJ | Sedan | 2,900 | |
| 10-C | Sedan | 3,160 | 44 | Sedan | 2,942 | | | | | 7-touring | 4,430 | | | | EH | Landau-roadster | 2,600 | |
| 10-C | Coupe | 3,000 | | | Nash | | | | | Coupe sedan | 4,588 | | | | EH | Touring | 2,550 | |
| 10-C | Brougham | 3,100 | 41 | Touring | 2,530 | | | | | 6-sedan | 4,775 | | | | EH | Coupe | 3,190 | |
| | Locomobile | | 42 | Roadster | 2,432 | | | | | 6-vest sedan | 4,875 | | | | EH | Sedan | 3,270 | |
| 48 | Touring | 5,325 | 43 | Coupe | 2,732 | | | | | 7-limousine | 4,715 | | | | EH | Sedan | 3,270 | |
| 48 | Sport | 5,080 | 44 | Sedan | 2,942 | | | | | Landulet | 4,565 | | | | EG | Chummy | 2,830 | |
| 48 | Limousine | 5,734 | | | National* | | | | | Brougham | 4,565 | | | | | Touring | 3,125 | |
| | McFarlan | | Sextet | | | | | | Runabout | 4,098 | | | | 4-K | Stutz | | | |
| 142 | Roadster | 4,600 | BB | 7-touring | 3,780 | | | | | Pilot | | | | | 4-K | Bearcat | 3,450 | |
| 145 | Sport | 4,700 | BB | 4-touring | 3,769 | | | | 6-45 | 5-touring | 2,890 | | | | 4-K | Roadster | 3,550 | |
| 147 | 7-touring | 4,700 | BB | Roadster | 3,769 | | | | 6-45 | Roadster | 2,830 | | | | 4-K | 4-pass. | 3,950 | |
| 151 | Town car | 4,900 | BB | Coupe | 3,870 | | | | 6-45 | Sedan | 3,245 | | | | | 6-pass. | 4,010 | |
| 154 | Cabriolet | 5,200 | | Sedan | 3,990 | | | | 6-50 | Coupe | 3,225 | | | | 48 | Vellie | | |
| 155 | Sedan | 5,200 | | | Oakland | | | | | 6-50 | 2-roadster | 3,050 | | | | 48 | Touring | 2,980 |
| 156 | Sedan | 5,200 | 34-C | Touring | 2,421 | | | | 6-50 | 5-touring | 3,050 | | | | 48 | Roadster | 2,850 | |
| 157 | Brougham | 5,200 | 34-C | Roadster | 2,231 | | | | 6-50 | 7-touring | 3,050 | | | | 48 | Sport | 3,065 | |
| 151 | Limousine | 5,100 | 34-C | Sedan | 2,733 | | | | 6-50 | Sedan | 3,300 | | | | 48 | Sedan | 3,301 | |
| 161 | Landulet | 5,100 | 34-C | Coupe | 2,550 | | | | 6-50 | Coupe | 3,300 | | | | 48 | Coupe | 3,195 | |
| | | | | | Oldsmobile | | | | | | Premier | | | | | 48 | 7-pass. | 3,215 |
| | Malbohm | | 46 | Touring | 3,150 | | | | 6-D | 7-pass. open tour'g | 4,120 | | | | 34 | Touring | 2,544 | |
| B | Touring | 2,350 | 46 | Pacemaker | 3,100 | | | | 6-D | 7-pass. encl. tour'g | 4,470 | | | | 34 | Roadster | 2,485 | |
| B | Sedan | 3,000 | 46 | Sedan | 3,400 | | | | 6-D | 4-pass. open tour'g | 4,070 | | | | 34 | Sedan | 2,895 | |
| 34-6 | Marmion | | 43A | Touring | 2,883 | | | | 6-D | 4-pass. encl. tour'g | 4,470 | | | | | Westcott* | | |
| 34-6 | Touring | 3,530 | 43A | Roadster | 2,858 | | | | 6-D | 2-pass. speedster | 3,950 | | | | C-48 | Touring | 3,550 | |
| 34-6 | 4-roadster | 3,600 | 43A | Coupe | 3,033 | | | | 6-D | 4-pass. coupe | 4,370 | | | | C-48 | Sedan | 3,700 | |
| 34-6 | 7-touring | 3,600 | 43A | Sedan | 3,143 | | | | 6-D | 7-pass. limousine | 4,290 | | | | C-48 | Limousine sedan | 3,750 | |
| 34-6 | Sedan | 3,850 | | | Overland | | | | | | | | | | C-38 | Touring | 2,900 | |
| 34-6 | Limousine | 3,900 | 4 | Touring | 1,914 | | | | | Reo* | | | | | C-38 | Roadster | 2,850 | |
| 34-6 | Landau | 3,900 | 4 | Roadster | 1,814 | | | | T-6 | Touring | 3,050 | | | | C-38 | Coupe | 3,200 | |
| | Maxwell | | 4 | Coupe | 1,994 | | | | U-6 | Roadster | 3,000 | | | | C-38 | Sedan | 3,300 | |
| | Roadster | 2,000 | | Sedan | 2,154 | | | | | Saxon | | | | | | Winton Six | | |
| | Touring | 2,100 | | | Willis-Knight | | | | | 125-DT | Touring | 2,630 | | | | 25 | Touring | 4,075 |
| | Sedan | 2,525 | 20 | Touring | 2,793 | | | | 125-DS | Sedan | 2,972 | | | | 25 | Roadster | 3,630 | |
| | Coupe | 2,225 | 20 | Roadster | 2,770 | | | | 125-DC | Coupe | 2,800 | | | | 25 | Limousine and sedan | 4,480 | |
| All Models | Mercer | | 20 | Coupe | 3,010 | | | | | Sayers | | | | | | | | |
| | Touring | 4,030 | 20 | Sedan | 3,142 | | | | | 5-pass. touring | 3,010 | | | | | *1920 figures, 1921 figures not given. | | |
| | Runabout | 3,600 | | | Packard Twin Six | | | | | | 2-pass. roadster | 3,050 | | | | | **Models not divided by years since 1916. | |
| | Raceabout | 3,260 | | | 7-pass. touring | 4,470 | | | | | 5-pass. sedan | 3,385 | | | | | **1919 figures used, 1920 and 1921 figures not given. | |
| Master Six | Metz | | | | 4-pass. runabout | 4,245 | | | | B-39 | Limousine | 4,110 | | | | | | |
| | Roadster | 2,650 | | | 7-pass. limousine | 4,595 | | | | B-40 | Scripps-Booth | | | | | | | |
| | | | | | | | | | | | Touring | 2,500 | | | | | | |
| | | | | | | | | | | | Roadster | 2,400 | | | | | | |

A New Cushion Wheel

THE cast metal wheel shown in the accompanying cut has recently been announced by a manufacturer who has for some years made a similar type of wheel without the cushion feature incorporated in the new product. The cushion consists of rubber with air pockets and is placed between the felloe band and a second metal band on which the solid tire base is mounted in the usual manner. The wheel consists of four parts—the hollow spoked wheel, rubber cushion, steel locking ring, for locking the rubber cushion in place, and the retaining rim outside the cushion. The air spaces are interconnected with channels which permit air to circulate in the periphery of the wheel and thus convey heat generated to the metal from which it is radiated. The cushion wheel differs but little in appearance from other cast spoke wheels made by the same concern, Smith Wheel, Inc. The makers state that the design is such that the tires cannot be forced off by hitting an obstruction. Depressions in the cushion retaining rim prevent creeping of the cushion around the wheel. It is said that the wheel requires no attention until the tires are entirely worn out.



Sectional views of Smith cushion wheel



The FORUM



Consolidation in Trailer Industry

Editor, AUTOMOTIVE INDUSTRIES:

Development of the trailer industry is now, and has been for several years, a sales problem. Mechanically the trailer is simple as compared with the motor truck, and the major engineering and manufacturing problems have been overcome. It will succeed in time, but the process is slow and made doubly hard by the present waiting attitude of industry and commerce for the anticipated turn in business conditions.

The industry has manufacturing facilities greatly in excess of present demands for its product and of probable sales possibilities for a year or two to come. Sales have doubled and tripled from year to year, but the increase has been more than equalled by additions to the number of manufacturers and increased productive facilities. Profitable operation of the plants therefore waits on larger sales.

This would be problem enough of itself under present conditions, but it is magnified by the fact that salability of the product is affected by manufacturing costs and the almost impossible necessity of getting the list prices down to a reasonable conformity with reduced truck prices. The prospective purchaser of a trailer mistakenly looks upon it as a mere assembly of truck frame, axles, springs, wheels and body, and feels that a price ranging from a third to one-half that of a truck of equal capacity is entirely too high. At the same time the trailer distributor and dealer take little interest in pushing the sale of trailers on an equal commission or discount basis with trucks, which are more easily sold and represent two or three times as much profit. Reduced prices of parts and materials and a lower wage scale will permit of some lowering of trailer prices, but the apparent disparity of list with truck prices will remain, as well as the problem of effective inducement to the distribution agencies.

High manufacturing costs are due primarily to the inability to get into quantity production. This is brought about by

1. Low volume of sales.
2. Division of sales among too many manufacturers.
3. Multiplicity of types, sizes and models.
4. Production of special designs to meet customers' wants.
5. Unsystematic operation of plants.

Most, if not all, of these faults are inherent in any new industry, and were very pronounced in the earlier years of the truck business before design came to be fully standardized and such variants as two and three cylinder engines, two-cycle and air-cooled engines, horizontal engines, friction and rope drive and other troublesome and inefficient designs were eliminated. Manufacturing cannot, of course, be on an economical basis until parts can be produced continuously in large numbers and assembled into the final unit in a systematic, progressive way that eliminates lost motion. Probably no better example of the advantages of this method exists than the manufacture of Ford cars, in which the concentration of all efforts on a single model permitted the fixing of a retail price that

led to a succession of increased annual sales followed by further price reductions. On one side of a certain but indeterminate line is the vicious circle of low volume and high cost, which react adversely on each other, and on the other side large volume and low cost, which affect each other favorably and lead to success. How to bridge the gap from one condition to the other is the problem that has wrecked innumerable manufacturing enterprises.

The most practical way of making this possible, in the opinion of the writer, is by a consolidation of the largest and best equipped companies now in the industry. There is no insurmountable difficulty in the way of accomplishing this; in fact, the possibility and advantages of such a consolidation are realized by leading trailer makers. A competent organizer from outside the industry, who could command or interest sufficient working capital, not necessarily very large, could put the deal across if he had a practical plan and was able to enlist the confidence of the industry.

Without attempting to outline such a plan here, it may be pointed out that about half a dozen of the most modern and best equipped plants now in operation have potential capacity to produce all the trailers likely to be sold during the next two or three years. Each plant, instead of manufacturing three or four types and as many sizes in each type, constituting a line of from one to two dozen models, could and should be confined to from four to six models, preferably of one type. For example, one factory should specialize in four-wheel models, another in semi trailers, another on pole trailers and a fourth on two-wheel balanced trailers. Or, the division could be made along the line of heavy-duty and light-duty models, in which standard parts and fittings would interchange to a considerable extent.

It is imperative that the total number of models should be reduced to the minimum consistent with good business policy and that these be standardized as to units. Many special parts of identical form and dimensions, as well as bolts, nuts, etc., can be used in several types of trailers and also in several sizes of the same type, since some oversize of these in the lighter models is not detrimental. This will reduce the number of drawings, patterns, molds, jigs, etc.

It is maintained by some of the manufacturers that trailers have not yet been developed to the point where standardization is practical; however, by selecting the best designs of all the companies that would be embraced in an amalgamation, very satisfactory and commercially salable models would result that would warrant standardization. One of the smaller plants could be maintained as an experimental shop for development of new patents and designs. This would avoid interruption of systematic production in the other factories.

Sales records of all the plants taken into the consolidation could be assembled, compared and studied to determine the trend of demand for different types and sizes and those eliminated for which there was relatively little sale and which were unprofitable. The reduction of models and standardization of those retained would increase the volume of each to be produced and greatly re-

duce the stocks of materials and parts to be carried by the factories and by the service departments of distributors and dealers. Much capital now tied up in such stocks would be released. Furthermore, adoption of standard dimensions of frames and axles would enable the frame and axle manufacturers to produce desired special designs for trailers and offer them to the trade at prices fairly comparable with such parts for trucks, whereas now the orders of individual trailer companies for any particular size and pattern are too small to justify the making of special forms for presses and forges.

The chief advantage accruing from a consolidation would be the pooling in one plant of all orders for a given type and sizes of trailers now divided among all the factories, with a resulting increase in volume that would permit continuous production in large lots, more extensive utilization of labor-saving machinery and progressive assembly.

A secondary advantage would be the possibility of eliminating much of the selling expense by consolidating or reducing the number of selling agencies in the different cities throughout the country and by reducing the percentage of advertising cost per trailer sold. It would be poor policy to curtail the aggregate advertising appropriation, as perhaps above everything else the trailer needs advertising and publicity, but the expenditures would be concentrated on fewer makes and models and as sales increased the cost per trailer would be less.

It would be desirable in a combination such as suggested to take in as many existing companies as possible whose product or whose business condition made their acquisition desirable. Stockholders in many of these companies would almost certainly be willing to exchange their holdings for an equivalent in stock of the new corporation. Others might have to be bought outright. The more companies taken in, the more competition would be eliminated and the more useful patents, sales data, goodwill, etc., would be acquired. It would be found advisable if, say, a dozen companies were embraced in the consolidation, to close about half of them, removing to the larger and better equipped factories such machinery and stock as could be utilized to advantage and disposing of the remainder, together with the land and buildings of the less efficient plants that were closed.

If assembling and sales plants were maintained in or near New York, at San Francisco, in the Middle West and at a Gulf port, large savings in freight could be effected on both domestic and foreign sales.

The present money market cannot be said to be favorable to launching such a consolidation, but there are so many strong arguments in favor of the trailer as an economical transportation medium that the favorable attention of capitalists and bankers can be obtained.

The personal factor must be taken into consideration in connection with the practicability of a trailer consolidation. Each company naturally believes it has the best designs and hopes to be among the successful survivors in the industry. All will admit, however, that industrial history indicates that not all will survive and that any one of them may be among the number that do not. They will also admit that efforts to reach voluntary agreements on standardization, reduction of models, exchange of patent rights, interchange of manufacturing and sales data, and pool advertising—all calculated to reduce manufacturing cost, increase sales and get the industry on a systematic, quantity production basis—have so far been ineffective and disappointing in their results. In normal times the trade might await the slow development of voluntary co-operation to bring these things about, but prevailing business conditions make such a delay unwise. Consolidation would make it possible to enforce economies

in manufacture and selling that would place the industry on a firm foundation ready to raise a towering and safe superstructure as rapidly as the business revival develops.

H. W. PERRY.

Battery Life

Editor, AUTOMOTIVE INDUSTRIES:

I note in your issue of July 21 a reference to the probable basic reason for failures of storage batteries as supplied for starting, lighting and ignition.

At the outset, let me say that I write not only from the viewpoint of one who has used and sold, but who has built and installed storage batteries for sixteen and one-half years.

In the first place, the automobile manufacturer is responsible for the "eight to fourteen months" batteries now usually supplied, his instructions to his purchasing agent being: "Watch price and capacity." In the days when starting and lighting batteries were being developed, the lowest price, the greatest capacity that could be crowded into a limited space, and minimum weight, were the factors in demand. Battery manufacturers met the requirements by thinning down the plates and increasing the number. This results in high capacity, light weight, a short lived battery and one not able to resist the abuse it is subjected to; hence the inevitable result is warped or buckled plates, internal short circuits, heating up upon charge and rapid disintegration; and, finally, a new battery and a dissatisfied customer.

Also, there is a feverish desire on the part of some battery manufacturers to have their battery standard equipment. Price being the goal of the purchasing agent, cheaper production by the battery manufacturers, and sales at little or no profit, a speedy renewal or new battery bought by the consumer and at a profit covering the virtual loss sustained when original was sold.

I can recall when I was in competition with other manufacturers and upon submitting my price was informed that it was 50 per cent too high; that it would cost the automobile manufacturer for his entire equipment \$250,000 more if my battery was bought; but I am satisfied that \$2,500,000 would have been saved the consumer.

AUTOMOTIVE INDUSTRIES is partly right in stating that the \$40 battery to the consumer would not have cost the automobile manufacturer \$10 additional had he demanded a battery that would have lasted the consumer 2½ to 3 years.

To illustrate, I was asked by a certain purchasing agent to fix up his battery (starting and lighting) that had been in a popular car about three years. Knowing the battery very well, I advised looking into the cells, and upon examination found the plates in excellent condition but slightly buckled. The plates were straightened and new wood separators put in, and the last I heard of the battery it was four and a half years old. That battery did not cost the consumer \$40, but it was sold to the automobile manufacturer at a fair price and all the profit was not received from the consumer.

If the automobile manufacturer desires, he can demand and will receive a battery that will last 2½ or 3 years under ordinary circumstances, but he will have to pay a reasonable price for same, and probably leave a little more space and carry a little more weight, but it will give the service. And if the automobile manufacturer would pay a fair price, the battery manufacturer would not be compelled to get all his profit out of the car user, nor would the owner be compelled to pay \$40 for a new one at the end of three years. But even if he did, \$40 less the allowance for the old one extended over three years is reasonable.

J. W. FRASER.



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Accessibility and Maintenance Cost

HOW much is it necessary to sacrifice in accessibility to attain low cost in the production of automotive vehicles? Very little, we believe, if sufficient study is given to maintenance and repair problems when laying down the design.

It is of great importance, of course, to study production problems if the first cost of any piece of apparatus is to be minimized, and this is more apt to be given consideration than the cost of maintenance for the reason that the designer is usually in closer touch with production than with the maintenance problems.

It must not be forgotten, however, that most purchasers of cars, trucks and other automotive equipment have already had experience with the same general type of vehicle they are buying, and that such purchasers usually know very well that the cost of maintenance is nearly or quite as important as first cost. For this, if for no other reason, factors controlling maintenance and operating cost should

be given much closer attention than heretofore.

Some chief engineers make it a point to get the benefit of criticism of service engineering in various local branches before deciding finally upon a new design. It is a good practice and one which could be profitably followed in all cases. Whether this is done or not no design should be put into production until it has been given careful consideration from the standpoint of accessibility and serviceability under average conditions of use.

Necessities, Not Luxuries

IT still seems necessary to occasionally point out that the automobile of to-day is a necessity and not in any sense a luxury. There are, of course, a small percentage of cars operated largely for pleasure by wealthy owners, which may fall in the luxury class, but even these are used more as a means of transportation than to give pleasure to the owner.

If any legislator doubts that cars are to be classed as utilities let him, for example, make a trip into any small town (more than half of our cars are used in towns of under 5000), and observe how and why cars are used for nearly all road travel in preference to horse-drawn vehicles. We recently had occasion to observe conditions in a New York town of about 500 inhabitants which is typical of thousands of towns in the East. Nearly every family had its automobile and could not do without it. The car carried milk to the creamery; it fetched cattle feed from the nearest railroad town 8 miles distant; it transported farm hands; it carried children to larger and better schools—to mention only a few uses. We were informed that less than a half dozen natives paid an income tax, yet men who should know better assert that an automobile is a luxury which no one with an income of less than \$2000 per year can afford to own!

The saving in time alone made possible by the use of a car often more than pays for it in the case of many owners.

A year ago some wiseheads predicted that the use of the automobile in common with other "luxuries" would be greatly curtailed during the current financial stringency, yet more gasoline was consumed in this country during the first six months of this year than during any previous six month period. Luxuries which are such in truth have been curtailed, but the automobile has long since become a utility of the first order, a necessity in our modern scheme of civilization. As such it can justly be taxed only as other necessities are taxed and in particular only as other means of transportation are taxed.

Sound Future Development

THE stability of the automotive industry and the sound basis present for its future development has been attested by every intelligent examination of authentic statistics. It is natural at a time like this that many persons will endeavor to predicate future trends on the basis of past statistics. This is an excellent tendency, despite its dangerous features, since

it indicates a desire to analyze the true facts of the situation and base future plans on sound data.

Among recent discussions along this line, the estimate recently made by C. A. Dana, president of the Parish Manufacturing Corp., is of interest. This executive estimates that there is a replacement market for 1,800,000 vehicles yearly on the basis of the present registration. This estimate indicates that there is a market for 83 per cent of the enormous 1920 production, even though no new buyers were developed. In discussing this estimate, Mr. Dana takes the sound view that we can look confidently to the future.

The best available statistics indicate a healthy growth for the industry. This growth, however, must be accelerated by careful analysis of markets and by intensive study of merchandising factors.

Internal Combustion Turbines

EVER since the movement toward higher fuel economy in automotive engines started, a certain amount of interest has been shown in the internal combustion turbine, as possibly a more efficient engine than the Otto cycle piston engine. The hopes attached to the internal combustion turbine in this connection are undoubtedly based on the great economies effected by the use of steam turbines as compared with reciprocating steam engines. According to recent figures, the best efficiency obtained from reciprocating steam engines is in the neighborhood of 15 per cent, whereas large multi-expansion steam turbines give as high an efficiency as 28 per cent. That a similar improvement in results cannot be expected from the gasoline turbine is fairly obvious when we consider the difference in the conditions. In the case of steam we have in the boiler a fluid under pressure which can be supplied directly to the turbine, thus doing away completely with reciprocating machinery. In the case of internal combustion apparatus, on the other hand, the working fluid must be compressed and exploded before it can be fed to the turbine, and thus the reciprocating machinery cannot easily be done away with.

Another difficulty with the internal combustion turbine is due to the high pressures and corresponding high gas velocities which must be employed. It is a fundamental rule of turbine design that for maximum efficiency the blade speed must be one-half the speed at which the working fluid issues from the nozzles. In internal combustion turbines it is difficult to attain the desired speed because the high temperature of the gases greatly reduces the strength of the blade material.

A very thorough research of the work that has been done on internal combustion turbines to date and on the possibilities which the turbine holds out for aircraft applications has recently been published by the (British) Aeronautical Research Committee (Engine Sub-Committee Report No. 54, *The Internal Combustion Turbine*, by W. J. Stern). The conclusion is reached that the internal combustion cycle cannot be utilized in a turbine powerplant without large losses. These losses are largely of a mechanical nature and take place in the compressor and in the

turbine proper. Owing to the limitations of peripheral speed by the state of the metallurgical art, either very lean mixtures must be used or else water injection resorted to, both of which practices are thermodynamically wasteful. It is shown that the best thermal efficiency which can be expected from a turbine of large capacity and fitted with a regenerator is 20 per cent, which compares with 28 per cent of present large aircraft piston engines.

Looking at the subject from the standpoint of other branches of the automotive industry besides that of aircraft, there are other objections to the turbine besides low thermal efficiency. To judge by the various designs which have been worked out so far, very little flexibility can be expected from this type of prime mover, which is in reality a one speed machine. The high speed of revolution required for a fair thermal efficiency necessitates a very great gear reduction, which would involve additional losses of considerable importance, and undoubtedly appreciable noise as the gears became worn.

Standards of Performance

GREAT benefits have accrued from the establishment of standards of performance, but untold difficulties have also arisen from the attempt to judge performance on the basis of inaccurate standards. Extreme care is always necessary in establishing a standard, for if it be set up as a measure of performance without being correct, it must of necessity warp the view of all the subsequent performances which are measured by it.

One important branch of merchandising seems to be afflicted by false standards. The true function and purpose of the publicity department of the automobile manufacturer has not been well understood.

In many cases it seems to be the policy of the management to judge the performance of their publicity man by the number of lines of "free publicity" he obtains, regardless of the quality of the material printed or the effectiveness of the mediums in which it appears.

In one case, for example, the management of a large company receives monthly reports from one of its publicity agents stationed in a city at a considerable distance from the home office. This report indicates the number of lines of publicity that have been obtained during the last month. When the number of lines shown in this report runs low, the publicity man is in for a "calling down." His natural reaction is to get more lines, regardless of how or where, since he is judged solely on that basis. Consequently he makes friends with the local newspaper men in the town in which he is located—a town comprising a small part of his territory. Through this relationship he puts over large quantities of publicity in these local papers, some of it good, some of it bad; all of it very limited in scope and effectiveness. But he is judged only by the quantity standard and gets praise for the number of lines.

A large part of the difficulty will be overcome when those in command fully recognize this fact, and set up sound standards of performance for publicity men.

Sales Outlook Improves Steadily

August Production Well Up with July

Better General Conditions Apparent—Farmers Coming Into Market

By JAMES C. DALTON

NEW YORK, Aug. 15—As the summer progresses the outlook for the automotive industry becomes increasingly encouraging. This applies not only to present but to future business. Manufacturers are not finding it necessary to curtail production schedules as sharply as had been expected and a considerable number of them have not reduced their output from the July schedules. Several companies are not able to keep pace with orders and their dealers are considerably behind on deliveries. Where it is not possible to meet the calls of all dealers, those coming from the agricultural districts, which were flat for many months, are met first.

It has become apparent that there is no dearth of purchasing power for automobiles either in the United States or other countries. The response which followed price reductions has amazed car manufacturers. They expected some stimulus to business, but nothing like what has followed. This is the reason why some of the more popular lines are behind in deliveries. They under-estimated demand.

The effect of price reductions has been equally significant in England, which was much harder hit than the United States by post-war depression. One great American company which had its English warehouses filled with cars began to liquidate its stocks as soon as the prices were cut, and so heavy has been the demand in the short period which has intervened that new shipments are actually being made.

Reports from various parts of the United States are that August automobile sales promise to equal or eclipse those of July. A prediction to this effect would have been considered chimerical a month ago. Business is distinctly better in the agricultural sections and in the South. Crops are being harvested and the price of cotton has advanced. This promises well for the months to come when the harvest is completed.

It is known that reports received by the General Motors Corp. for the first week of August indicate that business for this month will exceed that of July. With cars in various price classes, this condition can be considered fairly representative of the industry. It is true of Dodge, Studebaker, Reo, Hupp and Ford. In fact, steady gains in employment are

being made in Detroit. For the week ended Aug. 2 the manufacturers there employed 1231 more men than the week before. Men are being taken on not only in the car factories but in the parts plants.

Five Cleveland companies—White, Chandler, Cleveland, Jordan and Templar—report larger production schedules. Winton, Peerless, Stearns and Grant state that their output is being maintained at the rate reached in June and July. White is selling more trucks than it is making.

Not only are car manufacturers finding August business beyond their expectations, but there are gratifying signs of life in the truck industry. With the general improvement in business and the consequent increase in freight movements there has been a substantial increase in truck orders, although they still are far below normal. Truck sales will move upward only as the general movement of goods expands in volume. As the need for motor transport increases, sales of new commercial vehicles probably will be retarded until the stocks of American-made trucks re-imported from England and France are liquidated, but the number of such vehicles is not large enough to last long once business reaches anything like normal proportions. By that time it is probable congressional action will have curbed reimportations.

Close observers of conditions are more firmly convinced than ever that the truck industry really is in its infancy and that its expansion in the next few years will parallel that of passenger car development in the past decade. In spite of depression, there has been a surprising development in motor freight and passenger lines. In the passenger carrying end of this business the United States is lagging far behind Europe.

With the production of motor vehicles holding up surprisingly well, parts makers are beginning to feel the reflex, and the prospect for fall business is much brighter than it was two months or even a month ago. This is especially true of makers of unit parts. Probably the most encouraging feature of the situation is that both car makers and parts manufacturers have made very heavy reductions in the enormous inventories they had on hand when the slump came last year. This will necessitate soon a larger volume of orders from the vehicle factories and will send the parts companies into the market for materials.

Another trend of the industry which is arousing much interest and speculation is the demand for inclosed bodies. Indications now are that most companies will be flooded with orders for inclosed models in the next few months.

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Parts Sales Hold Up in Passenger Lines

Few Orders Booked from Truck Plants—Increases Expected in Fall

DETROIT, Aug. 15—Business with parts makers in the Detroit district is good or bad according to their degree of dependency on the truck industry. Those parts makers doing most of their business with passenger car makers find conditions holding up well; those relying chiefly upon truck orders for a large per cent of their activity are working along on a 50 per cent basis, some a little more, some less.

Truck parts makers do not look for real improvement in conditions until spring, though they expect a better business in the fall months due to farmer buying. Real improvement cannot come until industrial companies start using their trucks again, the parts makers citing their own cases to show that they are using only few trucks of their own fleets.

In the passenger car field business has been at a satisfactory if not normal capacity for the past three months. This same ratio is being maintained to-day and is expected to continue. Further than this it is impossible to forecast accurately owing to the prevailing tendency to hold orders to a thirty-day basis.

Practically all business now being done by parts makers is on the thirty-day basis. Though this has had a tendency to keep operations uncertain, it has resulted in a large amount of business being done and many standing orders have been greatly reduced, making certain a large amount of re-ordering soon to follow.

In quite a number of instances new orders are already being placed and many companies report inquiries which seem bound to develop new business. One condition which stands out prominently in the statements of parts makers, and which is the cause of genuine optimism, is that there are very few cancellations.

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STEPHENS FORCE NOW 400

FREEPORT, ILL., Aug. 16—July was the best month in the last 10 months, according to H. J. Leonard, general manager of the Stephens Motor Works, and prospects are that the August production will be 50 per cent greater than the July output. Four hundred men are on the payroll now and there are approximately 100 carloads of machines in advance of the present stock.

Graham Bill Passes in the House

Measure Important to Truck Industry

Reimports Legislation Said to Be Looked Upon Favorably by Senate

WASHINGTON, Aug. 15—From the viewpoint of motor truck manufacturers and dealers, the most important legislation acted upon in Congress since the war was the passage by the House by a vote of 186 to 83 of the joint resolution introduced by Representative Graham of Illinois which would impose an ad valorem duty of 90 per cent on all goods sent to France and England from the United States during the war and reimported for sale in this country.

Every effort will be made to get favorable action on the resolution in the Senate before recess is taken for the remainder of the summer. Senate leaders already have expressed themselves favorably on the measure.

While the resolution is not aimed specifically at reimportation of motor trucks, it will effectually end the unfair competition to which American makers and dealers have been subjected for the last six months. Sales, at practically half the list price, of reconditioned trucks which are new to all intents and purposes have made it difficult to find buyers for vehicles of the same type freshly made in this country.

Sale Is Nation-wide

The Truck Company of America with headquarters in New York has gone into the sale of these trucks on a national basis and is appointing dealers in the larger cities as well as guaranteeing a supply of parts. This company alone is understood to have on hand approximately 2000 of these vehicles. Most of them were purchased from the Slough Trading Co., an English corporation formed to buy up surplus trucks from the British government.

The first of these trucks were placed on sale in Los Angeles and they are now to be found all along the Eastern seaboard. All of them are of standard make and in good condition. The average price paid for the trucks by the Truck Company of America is understood to have been \$1,000 and the company expects to make 100 per cent profit on each sale.

A considerable number of trucks of a similar character have been sent into the country from France and there is an enormous quantity of American made automotive equipment in that country which speculators have expected to sell in this country.

Early passage of the Graham resolution by the Senate would put an end to

TRAILERS ARE VEHICLES, SAYS RULING, SO MUST CARRY LICENSES

COLUMBUS, OHIO, Aug. 17—According to an opinion rendered by Attorney General John G. Price, trailers are classed as motor vehicles in the meaning of the registration law and must be provided with license tags in front and behind. This ruling was called forth because of the practice of some trailer owners of using but one tag on a trailer or none at all.

duty free reimportation of these supplies and imposition of a 90 per cent ad valorem duty would put them in a price class where established dealers could compete successfully for the business which will follow the gradual restoration of normal business conditions.

A clause inserted in the permanent tariff bill by Chairman Fordney of the House Ways and Means Committee was designed to cover the reimportation evil but with the passage of the tariff bill indefinitely delayed, the Graham measure will meet the situation much more effectively. Its passage by the House brings to a climax a long and sometimes discouraging fight made by some of the elements within the automotive industry.

Scope Not Realized

For weeks after the first of the Slough trucks appeared on the Pacific coast, few persons within the industry seemed to sense the possibilities of this competition once truck sales again approached normal, but pressure finally was brought to bear upon Congress and leaders in both Houses began to see the seriousness of the situation.

The Graham resolution would cover vast quantities of war supplies of all kinds. The United States Liquidation Commission informed the House that this accumulation of materials was sold to France, England, Poland, Belgium and other countries for \$822,923,000. The original cost was \$1,739,189,302. Much of it was purchased by the governments themselves and later sold to speculators.

The bill will become effective as soon as it is signed by the President.

STANWOOD PLANS TO GO ON

ELIZABETH, N. J., Aug. 16—Plans are being developed for the reorganization of the Stanwood Rubber Co., which now is being operated under a receivership. Although the plant has been placed on the market, it is understood that arrangements will be made for a resumption of business.

Cameron Takes Over Greenville Factory

Implement Plant Will Be Used for Making Castings for Motors

NEW YORK, Aug. 15—Cameron Motors Corp. has taken over from Cass T. Wright the plant of the Greenville Implement Co. at Greenville, Mich., which will be used for the manufacture of castings for its motors and tractors. Cameron Motors recently acquired the plant at Sandusky, Ohio, of the Dauch Mfg. Co., making the Sandusky tractor.

Greenville is only about 200 miles from Sandusky and both towns are on the same railroad line, which will make the movement of castings convenient. The present capacity of the foundry at Greenville is 50 tons of castings daily and this output can be increased to 100 tons. Plans already have been prepared for an addition 80 by 150 feet. In addition to foundry work, Cameron Motors will use its new plant to make plows and other special equipment for the Sandusky tractor.

The consideration for the Greenville property is understood to have been about \$150,000. Charles A. Nevins, formerly of St. Johns, N. B., will be the engineer in charge of production at Greenville.

Cameron Motors has begun operations at the Sandusky factory and expects satisfactory business in the fall.

Fisk Rubber Operating at 90 Per Cent Capacity

SPRINGFIELD, MASS., Aug. 18—With a production of nearly 10,000 casings and 13,000 tubes daily, the Fisk Rubber Co. is operating its Chicopee Falls plant at 90 per cent of its peak capacity, officials announce. At the bottom of the winter depression it was down close to a 30 per cent basis. The August production schedule upon which the factory is now working calls for 225,000 tires, an increase of 32 per cent over the July output of 170,000 tires, which, in turn, represented an increase of nearly 50 per cent over June. The May output was but 65,000 tires.

Every month since May has shown a sales increase over the previous month for Fisk. Not only that, but the last three months have been ahead of the same period in 1920.

Fisk is rapidly working off its high-priced inventory and on the readjusted basis of 20 cents per pound for crude rubber, it is predicted, ought soon to show some net profits.

Japanese Motor Tax Hurts Orient Sales

Business Confined Almost Entirely to 4-Cylinder Cars—See Complete Halt

SEATTLE, Aug. 18—Until the excessive automobile taxes were initiated in April, six cylinder cars were the most popular type of passenger cars in use in Japan, while since April buying has been confined almost entirely to the four-cylinder, low horsepower cars, according to the latest information received here from the Orient. It is declared among motor dealers in Japan that there is no doubt but that the change has been brought about by the new taxes. Several of the largest importers of automobiles in Tokio report that they have sold no sixes since April.

The motor car dealers in Japan explain the attitude of the buyer as follows: A man may be willing to give eight thousand yen (\$4,000) for a motor car, provided that he believes this to be a fair price, but he will certainly strongly object to paying 850 yen (\$425) per year for the privilege of owning a motor car. Moreover, this tax does not depreciate with the value of the car, but continues at the same figure. Thus in three or four years, the tax is almost equal to the second hand value of the car, it is pointed out.

5000 Cars in Tokio

There are about 5000 motor cars in Tokio, a city of about 2,250,000 population. Tokio has fewer automobiles in proportion to its population than any other of the world's larger cities. Under ordinary conditions, an increase in the number of cars might be expected, but at present the number of cars is decreasing. It is feared that it will further decrease after the time when the first of the semi-annual tax payments is due, and motorists generally realize that the municipal authorities are in earnest about the tax.

Inasmuch as the vast proportion of the automobiles in use in Japan are of American manufacture, the feeling is growing among automobile importers in the country that American manufacturers, either individually or collectively, should launch an extensive campaign in that country to "sell" the general value of the motor car, as they are doing in the United States. Unless such a campaign is undertaken soon, it is believed that the movement of cars in Japan will be tremendously injured, if not halted.

EDDIE HEARN WINS RACE

SANTA ROSA, CAL., Aug. 15—Eddie Hearn, driving a Duesenberg-Distil car, won the 150 mile automobile race which opened the Cotati Speedway here yesterday. His time was 1 hour, 21 minutes, 19.5 seconds. Roscoe Sarles in a Duesenberg was second and Tommy Milton in a Durant Special was third.

"OLD DOBBIN" FORMS BUT 1% OF TRAFFIC ON RURAL ROAD IN IOWA

WATERLOO, IOWA, Aug. 17—A count was kept of the traffic over Rainbow Drive, the paved road from this city to Cedar Falls for seven days from 6 a.m. to 9 p.m. and the number of vehicles was 14,032. It was estimated about 7000 passed over the drive later than 9 p.m., bringing the total to more than 20,000 for the week. The observations were made by Macy Campbell of the Iowa State Teachers College. He was assisted by members of his family in making the actual count. Ninety-nine per cent of the traffic was motor. "Old Dobbin" came in for the lone one per cent, which goes to prove that horse drawn vehicles in prosperous farming districts are fast becoming extinct. Only 164 horse drawn vehicles passed over the Rainbow Drive during that week. This drive is the first section of 85 miles of Black Hawk County roads for which paving has been voted. The cost was \$42,000 per mile, one-half of which was paid by the Federal Government.

Monthly Inspections by Franklin Dealers

SYRACUSE, N. Y., Aug. 16—The H. H. Franklin Mfg. Co. of Syracuse announces that, effective at once, every one of the company's dealerships and sub-dealerships, 538 throughout the country in number, will make a monthly examination of all Franklin cars in their territory. This monthly inspection will, in the opinion of the officials of the company, go a long way toward placing in the hands of owners a correct understanding of the condition of their cars.

Particular attention will be directed to the fact that in many instances a trifling expenditure will correct minor mechanical ailments, which if allowed to run would sooner or later develop into serious defects, resulting in a large repair bill. Detailed plans for the operation of the inspection system have not been worked out but they will be perfected by a series of experiments.

FRIEND MOTORS RECEIVER

DETROIT, Aug. 16—Friend Motors Corp. and Olympian Motors Co., both of Pontiac, have been placed in receivership by Judge Tuttle in United States District Court here. The Detroit Trust Co. has been named receiver in each case. Friend Motors has been in need of working capital and has been unable to dispose of stock in the recent market. The policy of the receiver has not been determined. Olympian Motors has not been functioning for a considerable length of time.

Schools Purchase Many Motor Trucks

International Harvester Orders Also Heavy from Laundries —Farmers' Sales Small

SPRINGFIELD, OHIO, Aug. 18—Orders for the Springfield light speed motor truck, manufactured here by the International Harvester Co., are being received from various parts of the United States and also from several of the foreign countries. Shipments are going forward to boards of education and to laundry companies.

The demand for the high speed trucks are mainly from the cities and the rural school boards. Only a small amount of the business is coming from the farmers. It is stated that the farmers are unable to purchase trucks owing to the slump in farm products. In numerous instances farmers have two or three crops of grain on hand, and produce is only bringing a small price, compared to those of a few years ago.

The Springfield works of the International Harvester Co. recently shipped a fleet of trucks to Michigan for the use of laundry companies. A good sized shipment was also made to California, where the boards of education plan to operate bus lines this fall. The trucks for handling school pupils are mounted with special bodies having capacity of from 25 to 30 children seated. These trucks can be operated at the rate of speed from 25 to 30 miles an hour. It is stated that they can be run at a much faster clip, if necessary.

Constantinople to See Tractor Trials Sept. 5

WASHINGTON, Aug. 16—Competitive tractor trials will be held at Constantinople on Sept. 5, under the direction of the Turkish Ministry of Agriculture. Assistant Trade Commissioner Gillespie, at Constantinople, reports to the Bureau of Foreign and Domestic Commerce that written application either in French or Turkish must be made to the Minister of Agriculture prior to Aug. 31. Sealed letters giving the approximate selling price, c.i.f. Constantinople, in Turkish pounds, must accompany the application. Working tests will consist of plowing at depths of 8, 18 and 25 centimeters, pulling harrows, seeders and empty or loaded trucks. All expenses are to be paid by the competitor.

RECEIVERSHIP IS DECREED

INDIANAPOLIS, Aug. 16—Clarence Weaver has been appointed receiver for the Standard Automotive Corp. by Judge Moll in Superior Court here. The petition was filed by William E. Sanders, a creditor and stockholder. The corporation has a factory at Mooresville, where it is engaged in rebuilding automobiles.

August Truck Sales Look Good for Coast

July Totals Distinct Improvement Over June—Tractors Moving Steadily

SAN FRANCISCO, CAL., Aug. 16—The general condition of the motor truck distribution and selling business in northern California, from the Tehachapi Mountains to the Oregon boundary, showed a distinct improvement over that of June. Distributors and dealers in San Francisco, Oakland, San Jose, Sacramento and other centers of motor truck distribution estimate that sales were at least 20 per cent better during July than during June, and that July prospects, for purchases when the crops have been harvested and payment received for them, were 50 to 60 per cent greater than in the preceding month.

This increase in prospects means that sales will be considerably better along toward the end of August, and in September, than they have been during the months of the summer so far passed. August sales bid fair to be good, but the truck dealers are pinning their faith on the September business to make up for summer dullness. In general, in northern California, however, truck sales are not up to the standard the dealers and the dealers' organizations have set.

City Sales Are Best

Sales of trucks in the cities and larger towns have gained in proportion, on sales in the country. Six or eight months ago, about four times as many trucks were sold in the country, in proportion to potential users of trucks, as in the city. To-day, this ratio is only about three to two, instead of four to one.

Tractors are moving steadily, but slowly, and their sales seem to be lower than those of June only to the extent that these sales always fall off in the midst of the summer, when the farmer who could afford it has bought his tractor earlier in the year, and the farmer who is preparing to buy one is waiting, either to make a decision as to the one he will buy, or, more often, for the payment for his crops. All in all, however, the selling of commercial vehicles in northern California is in a fairly good condition, and the dealers are far more buoyant in spirit than they were eight to 12 months ago.

PLANT TO MAKE TRUCKS

TORONTO, Aug. 16—International Harvester Co. of Canada, Ltd., has announced that its wagon and sleigh plant at Chatham, Ont., is being equipped to take over the manufacture of International motor trucks. These trucks have hitherto been made in the United States and shipped into Canada. Demand now warrants their manufacture in the Dominion. First size to go into immediate production will be model "S" speed truck.

FARMERS USING FORD CARS; FORD RAILROAD WOULD END LOCAL STOPS

SPRINGFIELD, OHIO, Aug. 17—Because motor cars are being extensively used by farmers, Henry Ford wants permission from the State Utilities Commission to discontinue stops at a number of small towns along his Detroit, Toledo and Ironton Railroad. Ford's railroad has been affected by his Ford motor cars, and as a result he desires permission to discontinue local service to these towns.

Shorter trains of freights, not exceeding 50 cars, are to be handled on this railroad under the efficiency plan adopted by Ford. Formerly much longer and heavier trains have been handled. Many trains handled on this railroad are made up of cars loaded with Ford automobiles. Lately the average has been five trainloads of automobiles daily from the Ford plant at Detroit.

See 1000 a Month Ford Business for Mexico

DETROIT, Aug. 18—Ford Motor Co. shipments into Mexico are increasing at a rate which indicates that a business of 1000 cars a month will soon be realized by its Houston branch. All Mexican business is controlled by this branch with the exception of the States of Sonora, Sinaloa and Tepic. There are 180 dealers under the branch, which includes, besides its Mexican territory, the entire southern half of Texas.

Shipments from the Houston branch into Mexico were heavier in June than ever before. One trainload contained 248 cars and trucks. Most of the cars and trucks shipped by rail are knock-down. Cars going by way of Tampico by boat are shipped complete.

Representatives of the Ford company have just completed a survey through Mexico in which most of the important cities and towns were visited. Many dealers were appointed and the territory was thoroughly studied with a view to increasing sales and improving facilities in all parts of the republic. Many sections are fertile fields for tractors.

DODGE HAS NEW SEDAN

NEW YORK, Aug. 18—Dodge Brothers have made some changes in the design of the Sedan, the new models of which are just beginning to come through to dealers. The total height has been reduced 4 in., but the most conspicuous change is the use of steel disk wheels. The inside arrangements have been shifted somewhat, the divided front seat being eliminated and a solid seat used instead. This has resulted in a change in the door arrangement so that there are two doors and in addition to this the shape of the glass windows has been changed to a square type.

Atlanta Will Have Novel Parts Depot

\$2,000,000 Company Formed— Plans to Assemble Both Cars and Trucks

ATLANTA, GA., Aug. 17—With a capital stock of \$2,000,000 and headed by Walter T. Candler, vice-president of the Central Bank and Trust Corp., and one of the best known business men in the South, the Lullwater Co. has been organized and incorporated to establish an automobile industrial institute in Atlanta. Lionel J. Kahn, well known in automotive circles, has been named general manager of the corporation. Several prominent business men are connected with it as original incorporators.

The purpose of the company is to assemble under a single roof separate and individual industrial units of every kind connected with the automotive business. The idea is to make it possible to rebuild an automobile or a truck in this plant, or to repair any automobile or truck regardless of make. This plant will include complete paint shops, trimming and upholstering department, a silver and nickel plating department, and departments, each separate, for welding, boring, grinding, etc. In addition, the institute will accommodate tire, battery, accessory and automobile novelty dealers, and there will be a general parts department that will stock parts of every standard make of automobile in use in the southern States.

The new company has leased from Walter T. Candler one of the largest automobile buildings in Atlanta, which is located on Automobile Row and provides 114,000 sq. ft. of floor space. The building is five stories in height and preparations are under way to get the institute into operation at once.

RUBBER FIRMS BUY FABRIC

AKRON, OHIO, Aug. 17—Purchases of tire fabric are being made by virtually all the rubber companies in Akron except the "big four" which were caught with large inventories when the slump came. There is no expectation that fabric prices will be lower this year. The held over cotton crop in the South is of a quality not suited for tire fabric and the new crop is reported to be below expectations. The larger companies are ordering on their contracts but they will not work off their higher priced commitments before the first of next year and it will take Goodyear six months longer.

N. I. V. A. TO AID HOOVER

CHICAGO, Aug. 17—The National Implement & Vehicle Association has appointed a committee of 12 headed by G. W. Crampton of the Deere & Mansur Works, Moline, Ill., as chairman, to cooperate with Secretary of Commerce Hoover on the standardization of farm equipment.

Propose to Revise Liability Insurance

Underwriters Call Conference— Reforms in Automobile Business Likely

NEW YORK, Aug. 16—General revision of automobile liability rates will be discussed at a conference to be held in the near future by members of the National Workmen's Compensation Service Bureau. The call for the meeting states that there are indications that coverages and rates are not properly adapted to present conditions. In this connection A. W. Whitney, general manager of the bureau, says:

"It has been evident for some time to the automobile committee and to us in the bureau that this season should see a thorough overhauling of our automobiling rating system. There are many indications that our coverage and rates are not properly adapted to the present conditions in the automobile field. We are working on the problem in this office and have, for one thing, participated in a recent joint conference in Detroit between the bureau, the Fire Underwriters' Conference and a committee from the National Automobile Chamber of Commerce. This meeting, which was for the purpose of discussing fundamental matters of common interest, was of considerable importance in itself and also because it paved the way for a relationship in the future which may do much to bring our practices into closer relationship with the needs of the business.

"We propose to start the work of the automobile committee about the middle of September with an intensive consideration of the general problem."

The call for this conference and the statement by Whitney would indicate that the insurance companies are beginning to take seriously the threat made by automobile interests through the National Automobile Chamber of Commerce that, unless radical changes are made in the present automobile insurance system, mutual companies would be formed for the protection of manufacturers, dealers and car owners.

Reports from various sections of the country show that insurance companies are beginning to take into account the "moral hazard" which has been disregarded in the past.

Parts Business Good in Passenger Lines

(Continued from page 336)

Orders from manufacturers of light delivery trucks have gone a long way toward keeping business moving along as satisfactorily as it has. Parts makers feel that there is, for the present at least, a far greater opportunity in this field than in the heavy duty field, and expect a more general production of this class of truck than formerly. In their opinion too many truck manufacturers have neglected this opportunity in the past.

HANSON SALES GROW

ATLANTA, GA., Aug. 16—Reductions in prices of all Hanson models announced Aug. 1 by the Hanson Motor Co. here, resulted in an influx of new orders the first week of the month following

the announcement, officials of the company reporting the sales record for the week exceeds that of any previous week of the past several months. Carload orders were received, some by wire, requesting immediate shipment, from New York, Boston, Pittsburgh, Louisville and Birmingham.

KISSEL ADDS WORKERS

HARTFORD, WIS., Aug. 18—Since Aug. 1, the Kissel Motor Car Co. of Hartford, Wis., manufacturer of passenger cars and trucks, has increased its working force by 100 to 125 men who were laid off early in the spring. New business is developing so satisfactorily that it is believed possible to keep on increasing the force steadily.

CADILLAC INCREASES FORCE

DETROIT, Aug. 16—Cadillac Motor Car Co. is increasing its working force to meet increased demand for its product from larger cities of the country. About 1000 men will be added, factory officials declare, bringing production up to 65 cars a day, or 75 per cent of normal output. New business is reported to be running about even as regards enclosed or open models, with the enclosed car a slight favorite. Though the principal source of the new business is from leading industrial centers, the company declares improvement is becoming general.

DEMAND FOR NASH CARS

KENOSHA, WIS., Aug. 17—The Nash Motors Co. reports that the demand for its cars following the price cuts last month exceeded production by more than 50 per cent notwithstanding a considerable increase in the production schedule. Indications are that the heavy demand for cars will continue well in September. Dealers stocks generally are depleted and orders are being booked for future delivery. The demand for cars is divided almost equally between four and six cylinder models. Sales thus far in August have been fully as brisk as in July when Nash production was 2470 automobiles.

INCREASE FORGE OUTPUT

INDIANAPOLIS, IND., Aug. 18—Announcement has been made by the officials of the Imperial Drop Forge Co. of Indianapolis to the effect that large orders have been received from the manufacturers of the Dort and Lafayette cars, which has enabled the company to increase its production to a point near maximum. Company officials say the orders are the largest that have been received since the peak of last year.

HENRY L. INNES DIES

JACKSONVILLE, FLA., Aug. 16—Henry L. Innes, president of the American Motors Export Co. of this city, died here to-day. He formerly was connected with the Dodge Bros. Motor Co., the Chevrolet Motor Co. and the Parish & Bingham Corp.

German to Handle Sales for Durant

Leaves Olds to Join Ver Linden— Michigan Subsidiary Incorporated

NEW YORK, Aug. 16—Leon R. German, former comptroller and vice-president of the Olds Motors Division of the General Motors Corp., has been appointed sales manager for Durant Motors Corp. of Michigan, which is headed by Edward Ver Linden, former president and general manager of Olds. He will have charge of Durant sales in the territory between the Adirondacks and the Rocky Mountains and will assume his duties Sept. 1.

Close to Ver Linden

German has been closely associated with Ver Linden since 1913, when the latter became works manager for Olds. When Ver Linden was appointed general manager in 1916, German was given a more responsible position and finally was elected vice-president. He has been in charge of operations at the Olds plant since the retirement of Ver Linden. Announcement that he would join his former chief was made in AUTOMOTIVE INDUSTRIES several weeks ago.

Incorporation papers for Durant Motors Corp. of Michigan have been filed at Lansing. The capitalization is \$5,000,000 in common stock with a par value of \$10. W. C. Durant, vice-president, holds 130,000 shares. The other incorporators are: Edward Ver Linden, president and general manager; Edmund C. Shields of Lansing, secretary and treasurer; Carroll Downes and C. F. Daly of New York, all of whom hold 100 shares. Downes is connected with the Durant Corp. and formerly held a responsible position in a Philadelphia bank.

Plant Nears Completion

Work on the new plant at Lansing has progressed so rapidly that it is expected production of cars will begin by November. The Durant Four will be assembled in the meantime at the Long Island City plant.

Announcement is made at Durant headquarters that a complete line of six-cylinder automobiles, including five-passenger and seven-passenger touring cars, runabouts, coupes, sedans and limousines, will be made by the Durant Motor Co. of Indiana, which has taken over the Sheridan plant of the General Motors Corp. The directors of the Indiana company are Durant, T. W. Warner and D. A. Burke.

OGREN CREDITORS MEET

MILWAUKEE, Aug. 17—At a meeting of 55 creditors of the Ogren Motor Co. a committee of five was appointed to ascertain the condition of the company and report at another meeting which will be held as soon as possible.

Ford Plant in Japan Makes Speed Record

Car Assembled from 200 Parts
Ready for Road in 1½ Hours
in Yokohama

YOKOHAMA, July 30 (*By Mail*)—The Ford assembling plant established here by Sale & Frazar, who represent the Detroit manufacturer in Japan, has made a new speed record for the Orient. A complete car assembled from 200 parts is ready for the road in 1½ hours after the assembling begins. The work is carried on in a frame building 148 by 108 feet, where the crates containing the parts are unloaded direct from the docks to which they are brought by steamers from New York via the Panama Canal.

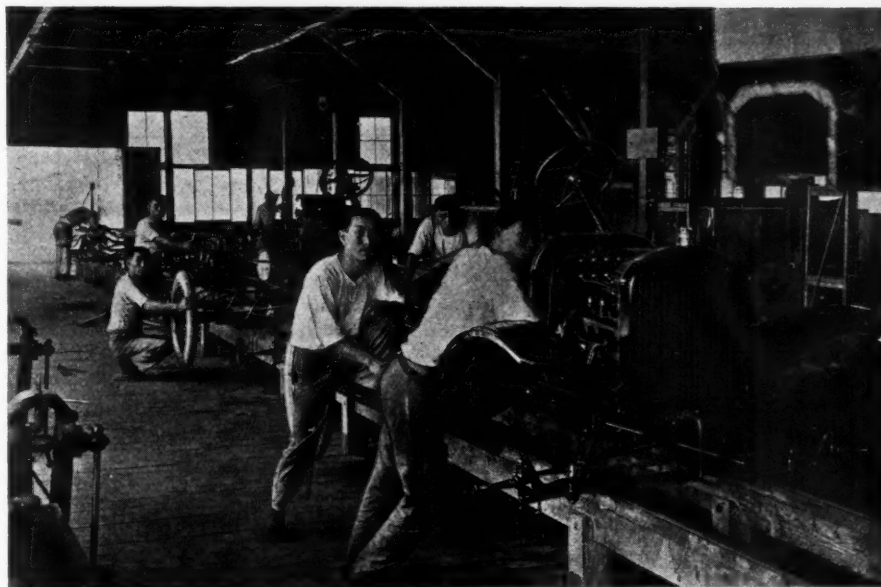
Once the Ford is uncased it is handled by various shifts of workmen in the plant at Negishi, which was opened in July, 1920, and is in charge of H. F. Brett, who was connected with the Ford plant in the United States before he came to the Orient. His assistant is F. Bennett, who was in the Highland Park Ford plant for 15 years. Both men are enthusiastic over their present chief, E. W. Frazar, who has built up a huge importing and exporting business in the Far East. In the 15 acres which take care of his interests at Negishi he has the Ford assembling plant, a Fordson tractor demonstration field where Japanese army men buy tractors, a big storehouse for Ford parts and a lumber mill.

There are crews of men to handle each stage of the assembling of the car. This is a great departure from the way the work was handled a few years ago. The first step is to lift the body out of the big box, in which it is shipped, by means of ceiling chains. The frame, the rear springs, the running boards and brackets all come in order and the car passes up the assembly line on two rails very much like railway tracks and on the way takes on the control shafts, the front axle assembly, the rear axle and differential assembly. The motor has previously been tested and is in the car. The last step in the assembly is to lower the body on to the chassis.

Normally six cars a day may be assembled at the Negishi plant, which is the outpost of Ford efficiency in the Orient. Last month was a busy one and the workers at the Negishi institution were kept working at the highest rate of speed yet attained.

LROYER MOTORS BUILDING

STOCKTON, CAL., Aug. 16—Completion of the Lroyer Motors Co. factory here will represent an investment of \$250,000, in 30 acres of ground and buildings, which are now well under way. The plant is to manufacture the Wizard four-pull tractor. Building has been stimulated noticeably in the Cherokee Lane section by the erection of this factory on that thoroughfare.



Turning Out Fords at Yokohama

Progress of Fords at the Negishi plant, Yokohama. The men are working on cars in comparative stages of assembly

British Makers May Cut Prices to Swell Sales

LONDON, Aug. 9 (*By Mail*)—Although there is some reason to be hopeful regarding the improvement of trading conditions in consequence of settlement of labor and other economic difficulties, it is doubtful whether the results of this year's trading and possibly even those of next year will be sufficient to wipe out the heavy losses suffered by some of the automobile manufacturers.

Before trade can be resumed on a substantial basis it will be necessary to mark down prices and further reductions are almost certain now that the engineers' union, embracing 1,500,000 men in various skilled and semi-skilled trades, has accepted a substantial reduction in the wage and piece rates. In view of this fact companies which have showed heavy losses probably will have all they can do to earn a covering profit on the coming year's turnover. Carry-over debts will have a serious effect on next year's net profit and may prevent the selling rate per car being made low enough to meet the reduced cost of U. S. cars.

BRAZIL BUSINESS OFF

WASHINGTON, Aug. 15—According to reports from Sao Paulo, Brazil, conditions in the automobile market of that city are even worse than in Rio de Janeiro. Large consignments of cars are to be held by the banks by reason of the refusal of the consignees to meet the drafts covering their shipments. The latest statistics show that during December, 1920, 56 trucks and four chassis and 599 automobiles complete and three chassis were received in Brazil from the United States. During November of the same year 85 trucks and 15 chassis and 582 automobiles and 12 chassis were received.

Australia Has Tentative Contract for Airplanes

WASHINGTON, Aug. 16—A tentative contract has been agreed upon for the construction in Australia of Australian parts of six airplanes to be used as training machines for the air force. The contract is to be let by the air council, according to Vice-Consul Ray Fox, and supervision and inspection is to be carried out by the arsenal branch of the defense department, while orders for the construction will be given to the Australian Aircraft & Engineering Co. of Sydney. At present steel of the required specifications is not manufactured in Australia, but it is anticipated that with the definite establishment of the airplane industry the necessary steps will be taken at the existing steel plants to comply with the special requirements. The company has been engaged in commercial construction of airplane parts and repairs for some time and proposes to undertake commercial as well as official construction work.

GOODYEAR LAYS OFF 900

AKRON, Aug. 16—President Wilmer of the Goodyear Tire & Rubber Co. announces that 900 men will be laid off this week, but that the reduction in the factory force is expected to mean only a slight curtailment of production, because of the steadily increasing individual efficiency of factory operatives. Goodyear has been averaging 2500 tires a day for the last few weeks in the Akron plant and 3500 tires in the California factory. No further reductions are contemplated for the remainder of this month, although the usual dull season for the tire industry in September and October may mean a curtailment of production next month.

Outlook for Sales Improves Steadily

Truck Industry Only in Infancy Close Observers Say—Motor Freight Develops

(Continued from page 336)

The various plants of the Fisher Body Corp. has so much inclosed body work booked that they can accept no more orders for work of that character.

A dispatch to AUTOMOTIVE INDUSTRIES from its Cleveland correspondent says:

"Cleveland body companies, especially those making inclosed bodies, are gradually swinging toward normal production. Within the last 30 days orders have been booked in much larger numbers. A further increase is expected after Sept. 1, and there is every indication that business will continue good throughout the winter. Demand as a rule is far ahead of the pre-war record and in some cases it is running close to the record-breaking figures of 1920.

With business surprisingly good for midsummer, there is every reason to believe it will improve steadily as the year advances. Encouraging factors are coming more and more to the front. Railroad earnings are steadily climbing because of the larger freight tonnage. The crop movement at this time of the year is seasonal, but more freight cars are being used for the movement of general freight. The improvement noted in steel orders for the past three weeks is holding its own.

Harvesting is being done this year unusually early and farmers are eager to get their crops to market. The wheat harvest has stimulated business generally throughout the Kansas City district. The yield was larger than anticipated, and a big corn crop is practically assured. Wholesalers of various lines of merchandise report an increased demand, indicating that the farmers are coming into the market.

The Northwest, all the way to the Pacific Coast, has been pretty thoroughly deflated and the worst is over in that section. While business will not return to normal for several months, the trend will be gradually upward and there are signs that the turn has begun already.

A distinctly better feeling is apparent in the South with some degree of stabilization in the cotton market. There was a sharp curtailment in cotton acreage this year and the crop is not as good as normally. It is becoming apparent that the hold-over in warehouses is not as large as has been generally believed. For these reasons cotton growers are certain to get better prices for their crop than they expected. Increased diversification of crops in the South is another favorable factor.

Altogether, the outlook for the automotive industry is growing brighter day by day. Apparently it is going to escape the worst of the usual seasonal slump.

Future Looks Bright, Is General Report

LOUISIANA GAINS DUE

NEW ORLEANS, Aug. 15—Business conditions in Louisiana this fall will show an improvement over the first nine months of the year, although sales are not expected to reach the volume of last fall. The general impression seems to be that farmers in this section will be required to liquidate their bank indebtedness to such an extent that they will have little money with which to purchase automotive equipment but the country banker probably will assist worthy dealers in clearing actual sales although discouraging the dealers from stocking excess vehicles.

These bankers will handle some deferred payment paper but it will be more closely scrutinized than ever before and they will have to be assured that the purchaser is financially responsible outside the car itself. They also will require larger cash payments.

General business conditions show a slight improvement and inventories are gradually being worked down. Merchants are taking their losses and cutting expenses. There is confidence that better times are coming but the process of readjustment is slow.

CHARLOTTE HOPES HIGH

CHARLOTTE, N. C., Aug. 15—Automobile business next fall and spring in this section is expected to be practically double that of a year ago. It is not likely however, that farmers who raise tobacco and cotton will be able to do much buying after they have liquidated their indebtedness. Indications are that country bankers will be very conservative in regard to handling automobile paper for the small town dealers. These bankers are loaded with notes given by farmers on last year's crops, which have not yet been sold and there is very little money in the smaller centers.

NEBRASKA PICKING UP

LINCOLN, NEB., Aug. 18—Automotive equipment jobbers of this city who have been making a survey of business conditions report a slight but steady upward turn in buying and indications from most parts of the State that this will be continued. Farmers have begun to sell the new crop and are also disposing of some of last year's crops held with the hope of higher prices and they are starting in to spend the money. Retailers in the automotive equipment field are reported to be feeling more cheerful than for several months.

IDAHO GAINS SLOWLY

BOISE, IDAHO, Aug. 16—Business conditions in Idaho are slowly beginning to pick up according to a survey made by Guy Flenner, secretary and manager of the Idaho Automotive Trade Associa-

tion. The State was hard hit by failure of last year's crops to bring profitable prices and some of the automotive men have suffered considerably through the transactions of dishonest dealers. With the turning of present season's crops into cash, buying again is on the upward grade.

TEXAS OUTLOOK FAIR

HOUSTON, TEXAS, Aug. 15—While conditions in southern Texas still are bad, the outlook for general business for the next year is reasonably encouraging. Prospects are that it will be slow for the next six months but that after that there will be a marked improvement which will carry it rapidly toward normal. Few of the farmers in this section will have funds to purchase automobiles or tractors when they have finished paying off their indebtedness this fall but with the harvesting of another crop they will be back in the market for automotive equipment.

CENTRAL OHIO GAINS

COLUMBUS, OHIO, Aug. 18—A slight improvement in the demand for trucks is reported in Columbus and central Ohio territory. This has been most noticeable since Aug. 1 and is especially marked in the lighter trucks and delivery wagons. Heavy trucks ranging from 2½-ton to 5-ton vehicles are still rather slow. Truck dealers are of the opinion that with a slow revival of business which is promised during the fall there will be continued improvements in the truck business. A better feeling is developing in farming communities as crop prospects have been improved by recent heavy rains. It is now believed that the worst of the slump in the truck business is now over and that business will show a gradual improvement.

CARL VON POETTGEN DIES

DETROIT, Aug. 18—Carl S. Von Poettgen, senior member of C. S. Von Poettgen, Inc., advertising counsel of this city, died here this week. In his life he had an active part in the development of the automotive industry, his firm handling the accounts of many leading manufacturers of cars and parts.

A CORRECTION

NEW YORK, Aug. 17—In a description of a new 1-ton Larrabee-Deyo truck in the August 4 issue of AUTOMOTIVE INDUSTRIES, through a typographical error this appeared as a six speed job where as a matter of fact the truck is a six cylinder model designed especially for higher speed.

The use of the hyphen instead of the comma completely changed the meaning of the sentence.

Kansas City Plans Keen Bid for Sales

Intensive Campaign Proposed— Farmers Are Liquidating Their Debts

KANSAS CITY, MO.—Two factors are operating to retard motor car and truck sales during August. One is the failure of the harvest returns to cover liquidation needs for farmers and merchants, and the other is the temporary depression into which retailers, and especially jobbers, have fallen, since reviewing the business of the first six months of this year.

The first factor is not as serious as it sounds, although it is generally admitted that the circulation of money has not reached the extent that had been anticipated for this month. Optimists had declared that the harvest returns would enable farmers to meet most of their back bills, and consequently merchants would be able to pay up their back bills, too. But this has not been the case. Many merchants will have to be carried over till winter on their 1920 overhanging indebtedness. They and the farmers are paying current bills promptly, but somehow the 1920 residue seems to stick in the unpaid files.

Wheat is not yielding the total revenue expected, but corn is turning out far better than expected, and other forage crops are in unusually good condition and volume. The total revenue of farmers, therefore, will be large for the year and eventually the volume of money will be adequate for normal present business and for the liquidation of the 1920 balance. There may be a few failures during the coming four months—but at last the readjustment is in sight.

The depression of merchants is due to their discovery that they have not made as much money this year as last.

In some cases the discovery has been of a very small profit for the six months or for the fiscal year. It has been a

strenuous period, with the necessity for extraordinary effort to secure a volume in money equal to last year, involving turnover of a great deal more merchandise. The merchants have been under a strain, and they have relaxed, often into melancholy, but an unusual number of them are on vacations, from which they will return with new vigor.

It is certain that merchandising in this community will be unprecedentedly vigorous this fall. Many merchants are known to have left orders for the preparation of big programs for selling, and it is notable that these programs do not involve special sales of bargains so much as special means of attracting attention to merchandise.

Merchants are swarming into Kansas City to buy merchandise, and it is obvious that about the same program of aggressive merchandising will be carried on throughout the territory in the fall. Motor car and truck dealers who adopt the "merchandise emphasis," who adorn their display windows, concoct original means of attracting attention, and get the spirit of pushing merchandise aggressively, on the assumption of a large purchasing power that minimizes price, will doubtless report later that trade has been wonderfully good this fall.

Advisory Board Will Run Supreme Motors

WARREN, OHIO, Aug. 17—Creditors of the Supreme Motors Corp. have decided that the affairs of the company can best be conducted by the appointment of an advisory committee of creditors to act with the officers of the company. F. B. Whitlock, vice-president of the Interstate Foundry Co. of Cleveland, has been appointed chairman of this committee. An agreement has been formulated contingent on the stockholders raising at least \$125,000 to be disbursed under the direction of the advisory committee. Payment of all claims would be extended to Oct. 1, 1922, with acceptance by the creditors of 7 per cent notes for the amount due them.

Coast Gas Cuts May Mean Labor Trouble

California Expects Disturbances to Follow Coming Wage Reductions

LOS ANGELES, Aug. 16—The 2-cent a gallon cut in the retail price of gasoline in California may be followed by serious labor disturbances in the oil fields, according to predictions now being made. Gasoline now retails at 23 cents a gallon. The Standard and Union companies were the first to make the cut and independents naturally followed at once. It has been known for some time that these companies had an over-supply of the fuel on hand and were getting ready to enter into more severe competition against several organizations that have been shipping gas here from the Oklahoma and Texas fields.

It is being predicted that once again California will see a gasoline war. In the big producing fields there is much less activity than one year ago. When these producers were unable to keep up with the demand enormous supplies were brought in from eastern fields. Some companies have kept on importing and have built up a large trade. It is a self-evident fact that the California producers can market their product cheaper than it can be brought from eastern states if they see fit, and with an overstock on hand it is very likely they will take this opportunity to make it hard for the importers, according to views expressed by those in position to know.

Acting upon the claim of over-production and slackened demand, the cut in price of gasoline has been followed by an announcement that oil field workers will have to stand for a cut of \$1 per day in wages beginning Sept. 1. The workers will resist this cut bitterly, according to reports, and if they do it is not improbable that there will be some very interesting and serious developments.

Statistics Given Hoover Show Increase in Rubber Tire Production

WASHINGTON, Aug. 15—The survey of current business for July issued by the Department of Commerce contains for the first time data on the production of rubber tires. This data was supplied by the Rubber Association of America. It takes November, 1920, as the basic month and shows a large increase each month since then except for December of last year, when there was a falling off in production. The table follows:

[Base Month in Bold Type.]

| Pneumatic Tires. | | | | Inner Tubes. | | | Solid Tires. | | | Raw Material Used. | |
|------------------|--------------|-----------|----------------------|--------------|-----------|----------------------|--------------|---------|----------------------|--------------------|---------------|
| YEAR AND MONTH. | PRODUC-TION. | STOCKS. | SHIP-MENTS—DOMESTIC. | PRODUC-TION. | STOCKS. | SHIP-MENTS—DOMESTIC. | PRODUC-TION. | STOCKS. | SHIP-MENTS—DOMESTIC. | FABRICS. | CRUDE RUBBER. |
| | Number. | Number. | Number. | Number. | Number. | Number. | Number. | Number. | Number. | Pounds. | Pounds. |
| 1920. | | | | | | | | | | | |
| November .. | 649,742 | 5,880,016 | 806,023 | 742,815 | 6,131,935 | 920,938 | 21,355 | 298,875 | 34,217 | 1,801,750 | 6,563,258 |
| December .. | 506,111 | 5,508,380 | 1,327,153 | 508,446 | 5,786,929 | 1,481,285 | 16,297 | 303,473 | 40,828 | 1,649,772 | 4,259,746 |
| 1921. | | | | | | | | | | | |
| January | 703,430 | 5,319,605 | 965,417 | 740,824 | 5,586,163 | 1,042,617 | 21,220 | 303,753 | 29,116 | 2,598,143 | 6,625,435 |
| February ... | 819,892 | 5,198,018 | 1,073,756 | 916,627 | 5,415,464 | 1,129,881 | 23,355 | 304,374 | 29,599 | 2,952,058 | 7,823,657 |
| March | 1,163,314 | 4,597,103 | 1,614,651 | 1,346,483 | 5,044,861 | 1,643,690 | 28,710 | 283,800 | 43,926 | 4,474,965 | 12,075,298 |
| April | 1,651,418 | 4,527,445 | 1,785,951 | 1,762,122 | 4,916,772 | 1,983,571 | 28,859 | 269,985 | 42,080 | 6,524,668 | 17,191,149 |
| May | 2,100,917 | 4,451,668 | 2,085,882 | 2,210,040 | 4,751,880 | 2,342,567 | 35,156 | 264,633 | 40,122 | 7,863,738 | 21,050,554 |

Automotive Industry to Bear No New Tax

**Additional Imposts Not Included
in House Bill—"Stigma
Tax" Remains**

WASHINGTON, Aug. 16—No additional taxes were proposed for the automobile industry in the tax bill as reported by the House Committee on Ways and Means. The Federal flat tax of \$10 per car and other modes of assessment on automobiles suggested by the Secretary of the Treasury were not mentioned in the committee bill. However, the committee failed to remove the discriminatory excise taxes which are known in the industry as "stigma" taxes.

An amendment to the excise taxes relating to accessories, merely changed the wording of the subdivision. The amendment would make subdivision 3 of Section 900 of the Revenue Act of 1918, read as follows:

"Tires, inner tubes, parts, or accessories for automobile trucks, automobile wagons, other automobiles, or motor cycles sold to any person other than a manufacturer or producer of any of the articles enumerated in subdivision (1) or (2) or in this subdivision, 5 per centum."

"Depressing Influences"

Chairman Fordney stated that the committee was of the opinion that "the exacting of the present excessive sums of taxes from the country contributes in no small degree to the depressing influences under which business and industry in general are staggering as an aftermath of the World War. The reduction of the tax burden is essential to business recovery and such reduction can only be based on a rigid enforcement of a policy of the strictest economy in the running expenses of the Government."

There is strong evidence that the House bill was drafted more for political expediency than for practical purposes. The belief exists that the yield contemplated in the House bill will fall far short of the revenue necessary to maintain the Federal Government. There is a feeling that the House bill will be revised in the Senate in order to provide sufficient funds.

The Republican conference changed the proposal of the House Committee on Ways and Means in order that the repeal of the excess profits tax and the reduction of the surtax and the 2½ per cent increase in corporation taxes should become effective January 1, 1922, instead of January, 1921. This change means that merchants will be obliged to pay taxes on the calendar year, a period which has been characterized by depression.

The House committee had originally proposed that if a corporation made a return for a fiscal year beginning 1920, and ending 1921, the war profits and excess profits tax for the portion of the year falling within the calendar year of

TRAILER PLANT SET AFIRE; BLOODHOUNDS ON TRAIL OF FIREBUGS

MILWAUKEE, WIS., Aug. 16—Wisconsin State fire insurance and fire prevention authorities are of the opinion that an incendiary is working to wreck the plant of the Highway Trailer Co. at Edgerton, Wis. On the night of July 4 fire destroyed an assembling building and warehouse, 190 x 960 ft. in area, causing a loss of more than \$250,000. Investigation developed suspicions of incendiarism. A short while ago another mysterious fire occurred causing a loss of \$25,000. Blazes were found simultaneously in several parts of the building. Officials of the Highway company immediately summoned the State fire marshal and several inspectors and provided bloodhounds, but the trail was lost on a road leading out of the city of Edgerton.

1921, would be an amount equivalent to the same proportion of a tax for the entire period computed under the revenue act of 1918, the portion of such period falling within the calendar year 1920, as of the entire period. They had also intended to credit any payments on account of the tax or refund but this will not be necessary under the agreement reached among Republican leaders of the House.

Because of the depression in the automobile industry during the latter part of 1920, and the early months of this year, the question of taking credit or deduction for losses against net profits is of the utmost importance. The House bill proposes to revive the net loss allowance in modified form by providing that if for any taxable year beginning after Dec. 31, 1920, it appears upon the presentation of evidence satisfactory to the commissioner that any taxpayer has sustained a net loss, the amount thereof shall be deducted from the net income of the taxpayer for the succeeding taxable year; and if such net loss is in excess of the net income for such succeeding taxable year, the amount of such excess shall be allowed as a deduction in computing the net income for the next succeeding taxable year.

Under a special rule, the bill will be passed Saturday and forwarded to the Senate, but the recess of the Congress until late in September, will delay the final enactment until October, and the same is true of the tariff bill.

TRAYLOR TRUCKS CUT

CORNWELLS HEIGHTS, PA., Aug. 17—Lower prices for all models of its trucks have been put into effect by the Traylor Engineering & Mfg. Co. The prices follow:

| Model | Old Price | New Price |
|----------|-----------|-----------|
| B—1½ ton | \$2500 | \$2390 |
| C—2 ton | 3000 | 2850 |
| D—3 ton | 3500 | 3300 |
| E—4 ton | 4700 | 4450 |
| F—5 ton | 5100 | 4700 |

Hudson-Essex Makes Third Cut in Prices

**Changes Take Effect Immediately
—Hudson Coupe Drops from
\$3,125 to \$2,770**

DETROIT, Aug. 17—The third reduction in price since the readjustment process began is announced by the Hudson Motor Car Co. The prices, which are effective immediately, follow:

| Hudson: | New Price | Old Price |
|----------------------|-----------|-----------|
| Touring car | \$1895 | \$2250 |
| Coupe | 2770 | 3125 |
| Sedan | 2895 | 3250 |
| Essex: | | |
| Touring and roadster | 1375 | 1445 |
| Coupe | 1880 | 1950 |
| Sedan | 2230 | 2300 |

Prices of the other Hudson models are: Cabriolet, \$2,495; touring limousine, \$3,120, and limousine, \$3,495.

Pierce-Arrow Reduces Passenger Car Prices

BUFFALO, Aug. 15—Following is the price schedule on Pierce-Arrow passenger cars, effective Sept. 1 as compared with the old prices:

| | New Price | Old Price |
|----------------------------|-----------|-----------|
| Touring cars | \$6500 | \$7500 |
| Roadster | 7000 | 8000 |
| Coupe, 3 passenger | 8000 | (new) |
| Coupe-sedan, 4 passenger | 8000 | 8500 |
| Town brougham | 8000 | 8500 |
| Sedan, 4-door, 4 passenger | 8250 | (new) |
| French limousine | 8250 | (new) |
| Limousine, 7 passenger | 8250 | 8750 |
| Landaulet | 8500 | 9000 |
| Sedan, 6 passenger | 8500 | 9000 |

General Motors Cuts Prices on All Trucks

PONTIAC, MICH., Aug. 17—General Motors Truck Co. announces price reductions, effective Aug. 17, on all its models. The largest cut is on the one-ton. The prices follow:

| | New Price | Old Price |
|-------------------|-----------|-----------|
| Model K 16 1 ton | \$1495 | \$1995 |
| Model K 41 2 ton | 3000 | 3250 |
| Model K 71 3½ ton | 4250 | 4500 |
| Model K 101 5 ton | 4650 | 5100 |

KOEHLER TRUCKS CUT

BLOOMFIELD, N. J., Aug. 17—Price reductions averaging about \$500 on its trucks and tractors have been announced by the H. J. Koehler Motors Corp. The prices follow:

| | New Price | Old Price |
|------------------------------|-----------|-----------|
| Model D 1½ ton | \$1885 | \$2285 |
| Model M 2½ ton | 2875 | 3365 |
| Model MCS 2½ ton | 2975 | 3450 |
| Model F 3½ ton | 3985 | 4450 |
| Model MT 5 ton, road tractor | 2975 | 3450 |

REDUCE KING CARS

DETROIT, Aug. 17—The King Motor Car Co. has made substantial reductions in its prices. The list follows:

| | New Price | Old Price |
|---------------------------|-----------|-----------|
| 4 and 6 passenger touring | \$2225 | \$2725 |
| Roadster | 2140 | 2740 |
| Coupe | 3125 | 3625 |
| Sedan | 3235 | 4035 |

Ver Linden Answers General Motors Suit

**Amplifies Statement of Counsel,
Claiming \$709,037 by Way
of Recoupment**

DETROIT, Aug. 16.—The answer of Edward Ver Linden to the suit for recovery of \$490,000 brought by General Motors Corp. as filed in United States District Court here, consists of a complete rebuttal of the allegations of the corporation, and announces that he will claim the sum of \$709,037 by way of recoupment. The case will be moved for trial when court convenes, but is likely to be long delayed owing to the heavy calendar of cases preceding it.

In setting forth his claims, Ver Linden amplifies the statement made by his counsel, Thomas, Shields & Silsbee, following the first filing of the suit by General Motors. The terms of his contract made under the Durant régime on Aug. 1, 1918, are set forth in the answer, showing that he was to receive \$100,000 a year salary and a percentage on earnings in excess of \$2,000,000.

Outstanding features in the contract quoted are:

On earnings up to \$5,000,000, the general manager to receive 5 per cent.

Earnings from \$5,000,000 to \$10,000,000, the general manager to receive 3 per cent.

Earnings \$10,000,000 to \$20,000,000, the general manager to receive 1 per cent.

In case corporation's earnings exceed or fall short of 30 per cent on the total capital invested, exclusive of good will, 2 per cent is to be added or deducted for each 1 per cent of excess or deficiency.

The amount of net earnings as determined by the corporation and set forth in its books shall be final.

Among other deductions or allowances from gross earnings shall be all necessary or proper reserves for losses, bad debts, insurance and other contingencies, suitable amounts for depreciation, besides all taxes, State, Federal or local, including Federal income and capital stock taxes, but excluding Federal war profits taxes and excess profits taxes.

Net earnings of division to be modified by rate of net earnings of the corporation.

One-third of the percentage earned at the end of the first year to be paid one-third in corporation's bonus stock, and in succeeding years two-thirds to be paid in bonus stock.

The aim of this form of compensation was to effect a large and continuing investment in General Motors stock by general managers.

Stock forfeiture clauses in the event of discharge or voluntary leaving were waived, the answer declares.

Money declared retained by the company to pay for bonus stock is as follows: 1918, \$108,080; 1919, \$234,230. Claim is made to \$166,727.33 as due for 1920 on basis of contract. An interest demand of \$2,916 on balance of 1918 salary held for two years is also made. To this is added \$100,000 as salary due for 1921, as per contract, and \$100,000 is added for probable share of earnings in 1921. Leave is asked to plead for such money as represents percentage on profit of Olds for 1921, when such can be ascertained.

July Shipments of Cars and Trucks 61 Per Cent of July 1920 and 7 Per Cent Less Than June 1921

NEW YORK, Aug. 16.—Reports made to the National Automobile Chamber of Commerce show that July shipments of cars and trucks by its members were 61 per cent of July, 1920, and 7 per cent less than for June of this year. Last year shipments were 4 per cent less than in June. Shipment figures by months thus far this year are:

| | Carloads | | Driveaways | | Boat | |
|----------------|----------|--------|------------|--------|-------|-------|
| | 1920 | 1921 | 1920 | 1921 | 1920 | 1921 |
| January | 25,057 | 6,485 | 29,283 | 3,185 | .... | 93 |
| February | 25,505 | 9,986 | 43,719 | 7,507 | .... | 99 |
| March | 29,326 | 16,287 | 57,273 | 9,939 | .... | 75 |
| April | 17,147 | 20,187 | 64,634 | 14,197 | .... | 1,619 |
| May | 21,977 | 18,608 | 74,286 | 15,193 | .... | 2,381 |
| June | 22,516 | 20,269 | 60,746 | 18,834 | 8,350 | 3,947 |
| July | 23,082 | 19,470 | 52,342 | 15,320 | 8,702 | 2,725 |

F. W. Warner Directs Durant Stock Sales

DETROIT, Aug. 17.—Fred W. Warner, former president and general manager of the Oakland Motor Car division of the General Motors Corp., has been placed in charge of the selling of stock for the Durant Motors Corp. of Michigan. Warner was the first of the General Motors executives to retire after the formation of Durant Motors, but he remained a director of the corporation, although it had been understood he intended to join Durant. He went with the Oakland company in 1914 as general sales manager from Chicago, where he had been manager of the Buick branch since 1911.

Warner is a native of Chicago. He began his business career with a retail hardware store in McPherson, Kan., where he remained until 1890, when he went with the John Deere Plow Co., Kansas City, as a salesman. When he left in 1904 he was sales manager. His next business venture was with a wholesale implement and vehicle house in Dallas, Tex., where he remained until he went with the Buick company.

HOUSE REJECTS DYER BILL

WASHINGTON, Aug. 16.—Though the Senate passed the bill known as S. 2272 to amend the National Motor Vehicle Theft Act imposing a fine of \$5,000 or five years' imprisonment, the House failed to approve the so-called Dyer bill which proposes to amend the act by putting in the word "embezzlement" to prohibit interstate transportation of stolen vehicles. Congressman Garrett, Democrat, of Tennessee, has been the chief opponent of the measure and his objection defeated it in the House. Congressman Dyer, the author of the House bill, stated that automobile manufacturers, dealers and users were in favor of the legislation as it would fortify and make the automobile theft act stronger.

SEAHOLM CHIEF ENGINEER

DETROIT, Aug. 17.—E. W. Seaholm has been appointed chief engineer of the Cadillac Motor Car Co., succeeding B. H. Anibal, who resigned to become chief engineer with the Collins Motor Car Co. Seaholm had been assistant chief engineer at Cadillac since 1913.

Commission Proviso Out of Highway Bill

WASHINGTON, Aug. 17.—As the result of an eleventh hour change of front on the part of Senate leaders, the provision of the Townsend highway bill authorizing establishment of a Federal highway commission to direct highway construction and maintenance was defeated to-day.

It was this principle of control for which the automotive industry has consistently fought. The parliamentary movement proved a surprise to Senator Townsend as well as southern senators who had heretofore opposed any change in the distribution of Federal aid funds. It is stated that the majority leaders abolished the commission proviso because of the fact that reorganization of Government departments will be considered soon and the highway bureau would become a part of the Department of Public Works.

For a time it appeared that the "agricultural bloc" in the Senate had taken control of the highway bill but attacks of Senator Wadsworth and Senator Lodge indicated that it was a drive of eastern States against the Federal aid program as it passed the burden to States already owning improved roads.

Senator Lodge directed his attack on the amount of the appropriation and stated that in accordance with the economy program of the Administration, savings should be made at this time in highway expenditures as it was only fair. The Senate leaders want to keep Federal expenditures down to reduce taxes and as a consequence it is believed they will insist that the proposed appropriation of \$100,000,000 annually be cut in half. The bill will be passed this week with minor changes.

The commission plan was agreed to by unanimous vote of the Senate postoffice committee when it was reported out to the Senate as a compromise measure. It probably would have passed Tuesday night if Senator Pomerene of Ohio had not objected to a vote because he lacked knowledge of the bill's effects.

The Senate leaders decided on a thumbs down policy in the interim. It is understood that their action means transfer of the bureau of public roads from the agricultural department to the proposed department of public works.

Receiver Named for Signal Truck

Decree Issued for Dissolution of Maine Corporation—Assets Exceed Liabilities

PORTLAND, MAINE, Aug. 17—Federal Judge Hale has appointed Philip G. Clifford of this city receiver for the Signal Motor Truck Co., a Maine corporation, with its plant at Detroit. Judge Hale also issued a decree for the dissolution of the corporation. The action was taken on complaint of Milton B. Hoagland, vice-president and general manager. He began proceedings in accordance with a vote of the stockholders. While business depression resulted in the closing of the plant, it is asserted that the assets exceeded the liabilities.

The company was incorporated in 1916 with a capital stock of \$600,000 in common and \$200,000 preferred. There is outstanding \$348,000 in common and all the preferred. All the common stock was deposited in a five year voting trust expiring this year. The voting trustees are Hoagland, C. P. King and A. C. Burch. The company has a funded debt of \$190,000 in 7 per cent bonds and \$220,000 in 7 per cent gold notes. J. G. Heaslet is president and H. H. Emmons is secretary.

The company has manufactured five models of trucks ranging in capacity from one ton to five tons. The capacity of the Detroit plant is 1500 trucks a year.

Colonel Colt, Rubber Chief, Dies of Stroke

PROVIDENCE, R. I., Aug. 13—Colonel Samuel T. Colt, chairman of the board of the United States Rubber Co., died to-day at his home in Bristol after a severe stroke of paralysis which he suffered a week ago. He was born in Paterson, N. J., in 1852. He was named after an uncle who invented the Colt revolver. His mother's family was one of the most prominent in Rhode Island in Colonial days.

Colonel Colt was graduated from the Massachusetts Institute of Technology at 21. He then entered Columbia law school and received a degree in 1876. He began practice in Rhode Island and soon became prominent in the politics of that state. In 1887 Colt founded the Industrial Trust Co. of Providence and while president of that company he entered the field of rubber manufacturing as a legal advisor and reorganizer.

The National Rubber Co. of Bristol was in bankruptcy when he took control and started the plant going again in 1888. Four years later the National company was merged with the United States Rubber Co., which had been formed by Joseph Bannigan. Colt took the presidency of the combination which he retained until 1918, when he became chairman of the board. He was a director of about 40 other corporations.

MANUFACTURERS ORGANIZE "SAFETY CLUB" AT JACKSON, MICH.

JACKSON, MICH., Aug. 8—A safety club has been organized in this city with H. D. Fisher of the Hayes Wheel Co. as president. Practically all manufacturing companies of the city are included in the membership, which, in addition to planning safeguards in factory operation, will also look to decreasing street accidents. E. H. Ehrich of the Sparks Withington Co. is treasurer, the other officers including city officials and men representing other industrial interests.

Seek Quick Action on Fisk Reorganization

NEW YORK, Aug. 15—Urgent notices are being sent to stockholders of the Fisk Rubber Co. calling their attention to the necessity for immediate action on the proposed reorganization and recapitalization plan. Another meeting will be held in the near future at which it is hoped definite action will be taken. Apathy on the part of stockholders was apparent at the meeting held last week at Chicopee Falls where the factory is located. The consent of 75 per cent of the preferred stockholders is necessary before they can consider the plan whereby the Fisk Co. would take over all the assets of the Federal Rubber Co. and the Ninigret Co.

It is understood that a banking syndicate headed by Dillon, Read & Co. is ready to underwrite a \$10,000,000 loan in the form of 20 year, first mortgage 8 per cent bonds.

Willys Predicts Big Car Sales Next Year

TOLEDO, Aug. 17—Activity in the automobile industry will be greater in 1922 than ever known before, declares John N. Willys, president of the Willys-Overland Co., in a résumé of the condition of his company issued this week.

He points out that splendid crop prospects and relief for the railroads promises more in the way of prosperity for next year than we have had this.

"Many people who have been getting along with old cars will purchase new ones, while others who have never owned a car will be numbered among purchasers when the returning period of prosperity puts them in position to buy," declared Willys.

In analyzing the work of the company this year he points out that the production of motor cars for Willys-Overland for the second quarter of the year exceeded that of the first quarter by 150 per cent. Shipment of cars during the second quarter was two and one-half times what it was the first quarter.

He anticipates the usual slackened production for a few months, but is confident that 1922 will set new records.

Stockholders Win in Standard Parts

Judge Westenhaver Refuses Creditors' Plea for Sale of Assets —Orders Dividend Paid

CLEVELAND, Aug. 16—Stockholders of the Standard Parts Co., which has been in the hands of receivers nearly a year, won a victory to-day when Federal Judge D. C. Westenhaver ordered that the receivership be continued. Creditors of the company had petitioned the court for an order to sell the corporation's assets at once.

Under the creditors' plan they would buy in the plants, form a new company to operate them and the stockholders of the present corporation would be given the privilege of subscribing for a limited amount of stock in the new concern. The creditors would retain control.

The court also allowed the request of the receiver, Frank Scott, for permission to pay a 10 per cent dividend to creditors. Approximately \$1,000,000 will be paid out under this order. The company will have \$500,000 in the treasury after the dividend is paid.

Judge Westenhaver declared that the actual physical value of the Standard Parts Co. is between \$17,000,000 and \$19,000,000 as compared to the \$12,000,000 to \$13,000,000 value fixed by the creditors. Commenting on the earnings of the company, the court expressed the opinion that operating losses during the receivership were less than \$60,000.

He said he believed the plant was being operated economically and that to turn the properties over to the creditors would be inequitable. The court further said that probably none of the plants could be sold at this time, and that if opportunities developed in the meantime, the properties could be disposed of as efficiently through the receiver as under the creditors' control.

The company, under the receivership, has made money in recent months. August business is holding up better than the average August in the past, and the management expects even better business during the fall months.

MERCER PLAN RATIFIED

NEW YORK, Aug. 16—Stockholders of the Mercer Motors Co. have ratified plans for the reorganization of the company as they were outlined two weeks ago. Theodore E. A. Barthel was elected vice-president and treasurer and George L. Catlin, assistant treasurer and secretary. W. A. Smith will be general sales manager. Reorganization of the company will be put into effect as soon as working capital becomes available through the new financing. The stock and bond issues proposed have been largely subscribed already, and it is not expected there will be any further hitch. Under the reorganization Mercer will be divorced entirely from Hare's Motors and will be operated as a separate entity.

\$12,533,909 Profit for General Motors

Statement Shows Gain of \$10,-
858,507 in 2d Quarter—
Balance Sheet Filed

NEW YORK, Aug. 16—Net profits of the General Motors Corp. for the second quarter of 1921 were \$12,533,909 as compared with \$1,675,492 for the first quarter, indicating the remarkable increase in business which followed the first three months. Total profits for the first half were \$14,209,402, but this amount is cut to \$9,659,531 by a reduction of \$4,549,870 to take care of refunds given purchasers of automobiles under guarantees against price declines. The amount reserved for this refund shows the effect on sales of lower prices.

The statement of earnings and a consolidated balance sheet, filed with the New York Stock Exchange, was accompanied by a letter from Pierre S. du Pont, president of the corporation, in which he told of the progress made in reduction of inventories and current liabilities.

Inventories, which amounted to \$222,098,805 in October, have been reduced to \$147,502,086. Of this reduction, however, \$25,776,112 was accomplished by the writing down of inventories.

President du Pont's Letter

During the same period of depression accounts payable, which had reached \$40,736,127, have been reduced to \$19,852,581, and notes payable from \$87,596,076 to \$68,808,250. In his letter, President du Pont says:

"The readjustment of financial affairs has been coupled with like improvement in the manufacturing part of the business. All factories have improved the quality and design of cars, so that the General Motors line is quite abreast with or in advance of the best construction practices of the day. The company is unique in its ownership of factories for the making of parts and accessories necessary for quality production at lowest price. Each part may be fitted exactly in workmanship, thus giving to General Motors cars a distinct advantage not enjoyed by cars built up of parts assembled from numerous uncontrolled factories.

"General Motors Corp. maintains a research laboratory that is without equal in the motor world. Here every part and assembly of parts is subjected to most rigid test and criticism, so that General Motors products, even when newly introduced, have been subject to practical proof. In this laboratory many new devices are being tested and much experimental work is being done toward maintenance of General Motors quality."

The consolidated balance sheet shows current and working assets of \$234,179,805, including \$49,363,653 in cash, \$5,547,867 in sight drafts against bills of lading, \$9,133,387 in notes receivable, \$21,042,606 in accounts receivable and trade acceptances and \$147,502,086 in inventories.

Current liabilities amount to \$110,060,804, including \$19,852,581 in accounts payable and trade acceptances, \$68,808,250 in notes payable and \$20,381,334 in taxes, payrolls and sundries accrued but not due.

General Motors' Remarkable Gain

The income and surplus account for the six months ended June 30, follows:

| | First Quarter | Second Quarter | Total Six Months |
|--|------------------|-------------------|---------------------|
| Net earnings..... | \$3,707,944.49 | \$14,551,516.41 | \$18,259,460.90 |
| Less: Provision for Employees' Investment Fund | 510,605.00 | 580,455.00 | 1,091,060.00 |
| Interest on notes and trade acceptances..... | 1,501,215.60 | 1,426,109.62 | 2,927,325.22 |
| Employees' Housing Development..... | 2,500.00 | 300.00 | 2,200.00 |
| | \$2,014,320.60 | \$2,006,264.62 | \$4,020,585.22 |
| Less: Provision for Federal taxes and extraordinary expenditures..... | \$1,693,623.89 | \$12,545,251.79 | \$14,238,875.68 |
| | 18,131.26 | 11,341.89 | 29,473.15 |
| Balance equals Net Profits before deducting refunds made to customers under agreement of October, 1920, which agreement guaranteed customers against price reductions before July 1, 1921..... | \$1,675,492.63 | \$12,533,909.90 | \$14,209,402.53 |
| Deduct total liability incurred under aforesaid agreement on account of 1921 sales due to price reductions made previous to July 1, 1921.... | | | \$4,549,870.99 |
| Balance | | | \$9,659,531.54 |
| General Motors proportion thereof..... | | | \$9,605,675.60 |
| Surplus, December 31, 1920..... | | | 121,273,217.00 |
| | | | \$130,878,892.60 |
| Less: Preferred and Debenture stock dividends—6 mos..... | | | 3,137,125.43 |
| Common stock dividends—6 mos..... | | | 10,230,975.25 |
| | | | \$13,368,100.68 |
| Surplus, June 30, 1921..... | | | \$117,510,791.92 |

Britain Expects Trade with Russia again Soon

LONDON, July 30 (By Mail)—There is now definite evidence that general trading with Russia will again become possible in the near future. The great stumbling block has been the reluctance of the Soviet authorities to recognize the financial obligations contracted by Russia under the old regime. It is now reported on official authority that a conference will be held soon to determine the amount of the debt and that when this has been done a plan will be promulgated under which Russia will undertake to resume payments in 1925.

In the meantime business has been developing for the last year or two in the countries which broke away from the former Russian empire and now form the independent states of Finland, Estonia, Latvia, Lithuania and Poland. These states form the threshold of Russia and when Russia begins trading these border states will assume the function of the middleman.

KENWORTHY FILES PAPERS

INDIANAPOLIS, Aug. 18—A schedule of assets and liabilities was filed in the Federal Court to-day by the bankrupt Kenworthy Motors Corp., of Mishawaka, showing assets amounting to \$124,433.38, and liabilities amounting to \$174,859.49. The concern recently admitted bankruptcy in answer to a creditors' petition, filed against it July 11 by the Auto Cape Top Co., the Western Brass Manufacturing Works of Chicago, and the Cleveland Pneumatic Tool Co. The Kenworthy corporation lists its excise tax due on automobile sales at \$6,980.77 and open accounts at \$119,652.14. Of the assets \$40,000 is in real estate and \$65,683.28 is in stock in trade.

Registrations Drop in Southern California

LOS ANGELES, Aug. 17—July showed a loss over June of almost 1000 in the number of new car registrations in Southern California. The total for the month was 4290, while June reported 5223, according to figures that have just been made public. As an indication of conditions in the outlying territory, 3078 of the new cars registered were from Los Angeles County. There are 10 counties in what is known as Southern California. The number of trucks and commercial cars registered during the month was 405. The totals to Aug. 1 for the year are 24,788 passenger cars and 3251 vehicles.

CANADIAN GARY FORMED

DETROIT, Aug. 17—The Canadian Gary Co. has been organized at Fort William, Ontario, to assemble and distribute Gary trucks in Canada and all British possessions. The company will take over the plant of the Canadian Steel Co. and expects to be in operation by Oct. 1. Officers of the company are: President, M. J. Neville; vice-president and general manager, C. Tremblay; secretary and treasurer, J. P. Kenney. The company is capitalized at \$500,000 and hopes to ship enough trucks before navigation closes on the lakes to keep the plant in operation all winter.

ELGIN, ILL., GETS TRUCK FIRM

ELGIN, ILL., Aug. 16—The Elgin Association of Commerce has accepted a proposition from the Duty Motors Corp., Greenville, Ill., manufacturer of motor trucks, to remove its plant to the former city. A site has been donated to the corporation and suitable buildings will be erected this fall.

METAL MARKETS

THE time appears to have arrived when the steel market is deserving of greater confidence on the part of buyers and this in their own interest. There are at this time in sight only two possible avenues leading to further downward revision of prices of more than fractional character. One of these is a reduction of freight rates which will come eventually but no one ventures to say when. The other road to a further cut in steel prices lies along the path of a sufficiently enlarged demand to warrant the assumption on the part of producers that another reduction in prices will bring out a sufficiently large quota of orders to more than make up for such a concession to buyers by the thus augmented rate of mill operations and the corresponding reduction in the overhead per ton of steel produced. Present prices for most descriptions of steel are scraping bottom, especially if prevailing costs are taken into consideration. What relatively slight price movement is in evidence just now is largely a matter of a more rational readjustment of quotations for certain classes of semi-finished and finished steel on the basis of the recently established levels for the raw steel from which they are made. Not only are conversion costs always more or less debatable, depending upon individual plant equipment and management, but, in the present circumstances, there is also quite a range between minimum and maximum wage scales and, in addition, some sheet mills are rolling \$30 sheet bars, others \$35 bars and still others are striving to reduce their losses on \$40 stock as much as possible. Some of the more farsighted captains of the steel industry aver that the time has come to forget costs of high priced material and to proceed even now on the basis of the enlarged demand and lessened overhead costs expected to result from a sagacious price policy as the most efficient means toward bringing about such a condition. In the case of smaller mills with only moderate resources it is natural, however, that they are loath to operate unless an immediate return is in sight. While there is virtually no danger at this time of a prolonged reaction in the steel market's trend, it will be well for the steel buyer to bear in mind that if present endeavors on the part of steel mills to broaden the demand and thus increase operations this fall should prove abortive, a short-lived price rally is not beyond the range of possibility. Such a recoil is now being witnessed in the pig iron market.

Pig Iron.—A much firmer tone pervades the pig iron market. Two steel mills operating blast furnaces and being periodical sellers of pig have declared \$20 to be the minimum price at which they will sell No. 2 foundry and, as a result, concessions by merchant furnaces have disappeared. The resale market is also much less attractive to bargain hunters.

Steel.—Intensive competition prevails for what automotive sheet orders are hanging over the market. No really large tonnages are being contracted for, even those passenger car builders whose schedules call for relatively heavy tonnages of sheets splitting their orders up into small "trial orders." These are placed with the understanding that if material and deliveries are satisfactory additional orders will be forthcoming. At that, a few sheet mills claim to have a comfortable amount of automotive

sheet business for September shipment on their books.

Aluminum.—New Orleans advices state that the Aluminum Line of steamships operated by the American Bauxite Co. will cease on November 1 to bring bauxite from Dutch and British Guiana and that the sole American aluminum producer's bauxite requirements will be met from the Arkansas mines until after a tariff preventing the "dumping" of German aluminum products has been enacted. The market for aluminum ingots, alloys and sheets continues flat. American warehouse stocks of foreign aluminum are estimated at 15,000 to 20,000 tons.

Copper.—Although sentiment is slightly improved, the avalanche of supplies precludes anything like genuine recovery at this time.

Tin.—Speculative ups and downs feature this metal which continues attractive in price to consumers.

Lead.—Automotive battery makers are buying in routine tonnages. The market is fairly steady.

INDUSTRIAL NOTES

Modern Die & Tool Co., manufacturers of motor bearings, Indianapolis, reports business better than normal, and the plant of the company operating at the limit of its capacity, with production at the highest mark in the sixteen years the company has been in business. "We are booked into the future and are running at full capacity. In our particular line business never was better than it is right now."

Biflex Products Co., Waukegan, Ill., manufacturers of the Biflex spring bumper, has announced its removal into a new and larger factory. It has twice the capacity of the former plant.

Portage Tire Asks for
Federal Protection

AKRON, OHIO, Aug. 17—With the adjudication of the Portage Tire & Rubber Co. of Barberton as bankrupt by Judge D. C. Westenhaver of the United States District Court at Cleveland, officials of the bankrupt company have filed a bill asking protection guaranteed bankrupt companies by Federal insolvency statutes.

The Portage Rubber Co., parent company to the Portage Tire & Rubber Co., also has been thrown into bankruptcy, but creditors have not as yet selected a trustee. George D. Bates has been named temporary receiver of the Portage Tire & Rubber Co., which lists assets at \$1,795,262.39 and liabilities at \$1,031,286.24. These proceedings have halted the receivership of the Portage Rubber Co., which last week was placed in the hands of W. T. Akers as receiver.

According to M. S. Long of Akron, president of both companies, attempts were made last fall to refinance the Portage Rubber Co. and negotiations were proceeding satisfactorily when receivership was petitioned for and obtained by the Adamson Machine Co., the Wellman-Seaver-Morgan Co. and the Factory Oil Co. The claims of these three creditors aggregated about \$47,000.

FINANCIAL NOTES

International Motor Truck Corp. reports for the three months ended June 30 last net profits of \$523,639, compared with a net of \$4,396 during the March quarters, when operations were recovering from the depression of December and January. The balance sheet as of June 30 shows cash of \$3,464,743, against \$3,125,694; accounts and notes receivable \$5,000,519, against \$3,472,348 on Dec. 31, 1920; inventories \$12,013,262, against \$15,599,848. Accounts payable are \$1,005,258. On Dec. 31, 1920, they were \$1,663,843. Surplus is \$10,406,546, against \$10,379,393.

Denby Motor Truck Co. proposes to increase its capital stock from \$750,000 to \$1,400,000 by the issue of 65,000 shares of 8 per cent non-accumulative first preferred stock at \$10 per share. A special meeting of the stockholders has been called for Aug. 26 to pass upon the matter, as well as upon \$300,000 first mortgage five-year 7 per cent bonds, \$100,000 Class A and \$200,000 Class B.

Durant Corp., which is handling the distribution of the capital stock of the Durant Motors, Inc., has increased the price of the stock to \$24 a share. The company quickly disposed of the original allotment of 500,000 shares at \$12. But as the demand increased the price was gradually raised to \$18, then to \$20, \$21, \$22, and now to \$24. The stock is selling for \$27 on the New York curb market.

Stewart-Warner Speedometer Corp. for the three months ended June 30 reports operating profits before Federal taxes of \$601,945, compared with \$740,843 in the corresponding months of 1920. For the first six months of 1921 profits amounted to \$652,892, against \$1,470,147 in 1920. For the first half of this year the company charged \$440,000 to surplus for inventory readjustment.

Federal Corp. of Westfield, Mass., has filed a voluntary petition in bankruptcy in the United States Court at Boston after a vote of stockholders. Liabilities are \$282,908 and assets \$62,544. The concern manufactured automobile accessories.

Maxwell-Chalmers Co.'s committee on reorganization has sent a letter to stockholders of the Chalmers Motor Co. who have not deposited their securities which offers them another opportunity to do so without penalty prior to Sept. 15.

McCord Mfg. Co. has paid off 10 per cent of its \$4,500,000 bank and merchandise indebtedness, totaling, with interest, approximately \$600,000. The remaining 90 per cent will be extended to Feb. 11.

Stevenson Gear Co., Detroit, has offered \$500,000 preferred and \$50,000 common stock in units of 2 shares each for \$25. It is a \$10,000,000 corporation.

Olds Plans 12,000 Output
of 1-Ton Economy Truck

LANSING, MICH., Aug. 18—Olds Motor Works has outlined a production of 12,000 annually of its new 1-ton Economy truck. Increased sales possibilities have been opened by the remodeling of the truck to 1-ton capacity, officials declare, and business is on the upward trend. Car sales are moving at the rate of 70 to 80 daily, holding to the June and July production figures, while only optimism reigns concerning prospects for the future.

MEN OF THE INDUSTRY

Norval A. Hawkins, sales director of the General Motors Corp., and previously sales manager of the Ford Motor Co., has been elected a director of the new Northwestern Casualty & Surety Co., of Milwaukee, organized with \$1,000,000 capital and \$750,000 surplus to write accident, health, workmen's compensation, liability, automobile, fidelity, plate glass, surety, steam boiler, burglary and theft, and casualty insurance, including property damage. It will begin business about Oct. 1 and for the present will specialize in Middle West and Northwestern territory.

W. E. McCarthy, formerly sales manager of the Owen Tire & Rubber Co., has joined The Dayton Rubber Mfg. Co.'s sales organization in the capacity of branch manager at Los Angeles, California. Since McCarthy has taken over the branch, the sales force has been increased materially. **C. F. Faro**, formerly Dayton branch manager, will direct the activities of the Kansas City and Denver branches. **H. K. Simmons**, formerly New York branch manager, will direct the activities of the Boston, Brooklyn and Philadelphia branches.

Lon R. Smith, vice president, directing sales and advertising manager of the Midwest Engine Co., Indianapolis, has left on his annual business trip to California. Although going to the Coast primarily to get in personal touch with the Utilitor dealer organization and to make an extensive investigation of markets, Smith also is making the trip in the interests of the Midwest heavy duty truck and tractor engine, at the request of truck and tractor manufacturers located on the western coast.

Harry A. Grubb has been appointed assistant sales manager of the Star Rubber Co., Akron, O. Grubb has long been associated in the tire industry with **A. G. Partridge**, newly elected vice president and sales manager of the company. Grubb's previous position was vice president and general manager of the Oldfield Tire Co., and prior to that he occupied various sales positions in the Firestone organization.

Capt. Eddie Rickenbacker has returned to Oakland to close up his affairs with the Sheridan Motor Co. of California and then return to Detroit, where he will make his headquarters. Rickenbacker is disposing of his interests in the Sheridan coast organization to **R. C. Durant**, son of **W. C. Durant**, who, with **C. M. Steves**, has been associated with Rickenbacker in the Sheridan enterprise since last fall.

E. A. Haertlein has been appointed sales manager of the Gemco Mfg. Co., Milwaukee, manufacturer of automotive equipment and garage fixtures. He succeeds **George H. Treviranus**, who resigned to become associated with a new concern now in process of organization in Milwaukee to engage in the manufacture of rowboat motors and other small internal combustion engines.

Wm. H. Herbert has been appointed general sales manager of the Denby Motor Truck Co., succeeding **L. B. Graham**, resigned. Herbert is one of the oldest members of the Denby organization, having filled such posts as special field representative, assistant sales manager, and more recently as manager of the company's Detroit branch.

Fred E. Castle, of the Fred E. Castle Co., Detroit, announces the termination, by agreement, of his contract with the Hayes Wheel Co., of Jackson, Mich. Castle is known to

the industry as one of the veteran sales representatives in the motor car equipment and accessory field. He has not made known his plans.

Guy W. Vaughn, who has resigned as general manager of the Van Blerck Motor Co., Monroe, Mich., will be the new vice-president and general manager of the Standard Steel & Bearings Co. of Philadelphia. He will remain as vice-president and a director of the Van Blerck company.

George Stowe, former manager of the New York branch of the Mitchell Motors Co., has been appointed general manager of the Reo Motor Car Co. of New York to succeed **James J. Hunt**. Stowe was New York manager for the Chalmers Motor Car Co. before going with Mitchell.

C. A. Brownell, former advertising manager for the Ford Motor Co. has returned from a long vacation in California and has assumed his position as vice president in charge of sales, distribution and advertising of the Wildman Rubber Co., Bay City, Mich.

C. P. Fisk of Racine, Wis., has resigned as district manager of the Burroughs Adding Machine Co., to accept the position of district manager of retail sales in Racine and Kenosha counties for the Mitchell Motors Co. of Racine.

Dr. Joseph W. Roe, secretary of the Railway Car Manufacturers Association and executive engineer of the Pierce-Arrow Motor Car Co. of Buffalo, has been appointed professor of industrial engineering of New York University.

J. E. Roberts has resigned as general sales manager of the Cole Motor Car Co. of Indianapolis to become effective October 1. He has not made known his plans.

Mason Tire and Rubber
Working 24 Hours a Day

AKRON, OHIO, Aug. 17—The Mason Tire & Rubber Co. of Kent, near Akron, has increased its production from 1800 to 2000 tires daily and is now operating on a basis of 24 hours a day. In units, Mason sales are running four to one over the same month of last year, while the month of July showed an increase of 50 per cent over July of last year.

"Production of solid truck tires is heavy and increasing steadily, and owing to the fact that even now consumers and dealers are buying only current requirements, we look for business to hold up steadily throughout August and September and possibly October, which is a distinct reversal of sales conditions of recent years, when the peak has been reached in the spring rather than in the fall," said a company official.

INSOLVENCY IS ALLEGED

INDIANAPOLIS, Aug. 16—A petition has been filed at Sullivan, Ind., for the appointment of a receiver for the Mutual Truck Co., with a plant in that city. The petitioners are the Electric Steel Co. of Indianapolis and Sherman & Pomeroy, Inc., advertising agents in Chicago. It is alleged that the company is insolvent and that it owes \$85,000. The capital stock of the corporation is \$500,000 and nearly all the stock is owned by residents of Sullivan County.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

NEW YORK, Aug. 16—As a result of unfavorable weather during July, there has been a material reduction in the estimates of the crop yield published by the Government as of August 1. The wheat crop, both winter and spring, estimated at 757,000,000 bushels, which is now practically harvested, shows a decrease of 52,000,000 bushels from the July 1 estimate, and of 73,000,000 bushels from the last five year average. The estimate of 1,137,000,000 bushels of oats is slightly higher than the July 1 estimate, but 296,000,000 bushels below the five year average.

The yield of corn on August 1 is estimated as 3,032,000,000 bushels against the July 1 estimate of 3,123,000,000 bushels, which may be compared with the five year average of 2,798,000,000. The decreases in the estimates for other grains are in proportion to that of wheat and corn. The decrease in the estimate for potatoes, however, is very large, 316,000,000 bushels on August 1, against 377,000,000 on July 1, but this estimated yield is considerably above the five year average of 271,000,000 bushels. These estimates, as a rule, are much lower than the yields of recent years since war demands stimulated agricultural activity.

Liquidation continues in our financial position at a rapid pace. The report of the Federal Reserve System for August 10 shows a decrease of \$90,000,000 in bills discounted (loans), while bills bought in the open market increased \$15,000,000, making the total bills on hand \$1,570,000,000. Discounted bills held by the Boston, New York and Cleveland banks include \$53,000,000 of bills discounted for the Richmond, Atlanta, Minneapolis and Dallas banks, compared with \$57,000,000 in the previous week.

A decline of \$18,000,000 took place in the deposits of the member banks' reserve account, and \$21,000,000 in Government deposits, which brought total deposits down to \$1,662,000,000. Note circulation declined \$16,000,000 to \$2,520,000,000. Gold holdings increased \$23,000,000, but other reserves declined \$6,000,000, total reserves being \$2,720,000,000. As a consequence of these changes, the ratio of total reserves to deposit and Federal Reserve note liabilities combined increased from 63.7 per cent on August 3 to 65 per cent on August 10, and the ratio of gold reserves to Federal Reserve notes in circulation, after setting aside 35 per cent against deposit liabilities, increased from 83.1 per cent to 84.9 per cent. Since Jan. 1 of the present year, the Federal Reserve Banks have gained a total of \$513,000,000 in gold and lost about \$46,000,000 in other cash reserves.

All classes of money hardened last week, which preceded large Government mid-month financial operations. Call money remained stationary at 6 per cent through the week, with very little activity in the market.

Calendar

SHOWS

Sept. 5-10—Indianapolis, Automobile and Accessory Show in conjunction with Indiana State Fair conducted by Indianapolis Automobile Trade Association, John B. Orman, Mgr.

Sept. 28-Oct. 8—New York, Electrical Exposition, 71st Regt. Armory, Electric Equipment, Machinery and Vehicles.

Nov. 27-Dec. 3—New York, Automobile Salon, Hotel Commodore.

January—Chicago, Automobile Salon, Hotel Drake.

Jan. 7-13—New York, National Automobile Show, Madison Square Garden, Auspices of N.A.C.C.

Jan. 28-Feb. 2—Chicago, National Automobile Show, Coliseum, Auspices of N.A.C.C.

Feb. 20 to 25—Louisville, Ky., Louisville Automobile Show, Auspices Louisville

Automobile Dealers Association.

Sept. 9 to 17—Ottawa, Ont., Can.—Ottawa Motor Show.

Feb. 6 to 11—Winnipeg, Can., Automotive Equipment Show, Western Canadian Automotive Association.

FOREIGN SHOWS

September—Buenos Aires, Argentina, Passenger Cars and Equipment. La Pabellon de las Rosas. Automovil Club Argentino.

September—Buenos Aires, Argentina, Cars, Trucks, Tractors, Farm Lighting Plants and Power Farming Machinery. Palermo Park; Sociedad Rural Argentina.

September—Luxemburg, Luxemburg, Agricultural Sample Exhibition.

Sept. 5, 1921—Constantinople, Traction trials under the direction of the Turkish Ministry of Agriculture.

Sept. 23-Oct. 2—Berlin, German National Automobile Show, Auspices of German Automobile Mfg. Ass'n and German Automobile Club.

Oct. 5-16—Paris, France, Paris Motor Show, Grand Palais, Administration de l'Exposition Internationale de l'Automobile, 51, Rue Pergolèse, Paris.

Nov. 4-12—London, British Motor Show, Society Motor Mfrs. and Traders.

November 7-14—Paris, Seventh International Exposition of Aerial Locomotion in the Grand Palais of the Champs Elysees, Held by the Chambre Syndicale des Industries Aeronautiques.

March, 1922—Santiago, Chili, Annual Automobile Show.

May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.

Sept. 1922—Rio de Janeiro, Brazil, Automobile exhibits in connection with the Brazilian Centenary Association Automobilista Brasileira.

CONVENTIONS

Sept. 14-15-16—Detroit, Credit Convention Motor and Accessory Manufacturers Association.

Oct. 12-14—Chicago, Twenty-eighth Annual Convention National Implement & Vehicle Ass'n.

Nov. 22—New York, Convention of Factory Service Managers, National Automobile Chamber of Commerce.

Dec. 27-29—Chicago, American Society of Agricultural Engineers, Auditorium Hotel.

RACES

Lab or Day—Uniontown, Pa., Autumn Classic.

Aircraft Industry Is Sound, Declares Chief

NEW YORK, Aug. 17—J. K. Robinson, Jr., president of the Manufacturers Aircraft Association, Inc., reporting on the condition of the aircraft industry, stated to-day:

"The readjustment of the aircraft industry to a substantial basis, from which it can begin to build a solid and profitable commercial business, has been practically accomplished. The achievement is regarded as unique and should provide considerable encouragement to long established lines in other fields of transportation which have been suffering from temporary depression.

"This year, which has seemingly been marked by industrial depression generally, has witnessed an upturn in the aircraft industry. The 15 or 20 manufacturing plants have been readjusted to a sound operating basis. Experimental engineering has greatly improved the usefulness and safety of aircraft. The thousand or 1200 airplane operators have definite assurance in the President's message, that, before many weeks, an aerial code will be passed, thus giving the entire art a legal status.

"With this constructive legislation actually in sight, the aircraft industry is making renewed efforts to exploit commercial aviation and there is gratifying indication that the public is ready to accept aircraft as an expeditious means of transport supplementing the railway, steamship and motor car, and that forestry, agriculture, mining, banking, photography, surveying, fishing, advertising, etc., will pay liberally for the improved and unique service which the commercial airplane offers."

Permanent Receiver for O'Bannon Corp.

NEW YORK, Aug. 16—Richard Le Baron Bowen, vice-president and general manager of the O'Bannon Corp., who has been acting as temporary receiver

of the company, has been appointed permanent receiver. The company manufactures artificial leather and rubber fabrics for automobile tops at West Barrington, R. I. It has outstanding \$1,000,000 in common stock and \$494,000 in preferred. It has no funded debt and its present difficulties are due to the general business depression. Dividends on both classes of stock were paid up until last year. The plant and equipment are valued at \$938,749 and trade-marks and patents at \$700,000. The balance sheet as of Dec. 31, 1919, showed total assets of \$5,348,905. T. M. Reynolds of Boston is president of the company. E. V. R. Thayer, New York banker, is one of the directors.

Willys Subsidiary Changes Directors

NIAGARA FALLS, N. Y., Aug. 17—Four changes in the directorate of the United States Light & Heat Corp., a Willys subsidiary, were made at the annual meeting. The new directors elected were H. I. Shepherd and W. B. Stratton of New York, D. H. Kelly and R. H. VanNest of Niagara Falls. They took the places of J. R. Harbeck, J. A. Roberts, J. A. Smith and C. L. Lane. Lane was a vice-president and general manager. The directors elected Kelly a vice-president and Shepherd was made treasurer in place of H. H. Knapp. John N. Willys continues as chairman of the board. Confidence in the future was expressed in the report submitted by President C. O. Miniger. The financial statement soon will be distributed to stockholders.

KALAMAZOO SEDAN TO GO ON

KALAMAZOO, MICH., Aug. 16—The stockholders of the Kalamazoo Sedan Co. have voted to continue the business. Sufficient funds will be available to pay all obligations and give sufficient working capital for immediate needs. The plant has been idle for the past four months.

\$1,500,000 in Notes to Pay Seiberling Debts

AKRON, OHIO, Aug. 17—Under the terms of a \$1,500,000 mortgage recorded here and executed and delivered by the Prudential Securities & Realty Co. to the Union Trust Co. of Cleveland, 1500 \$1,000 notes maturing July 31, 1923, will be issued to liquidate the debts of F. A. Seiberling, founder and former president of the Goodyear Tire & Rubber Co. The Prudential Securities & Realty Co., recently was organized with George Steele of Cleveland as president, and A. W. Cannon of Cleveland as secretary, to act as trustee of the assets and liabilities of Seiberling.

The mortgage negotiated covers Seiberling's real estate, his personal property and his various corporate holdings. The mortgage lists 32 parcels of real estate in Summit County and several in Florida and Michigan, 125,701 shares of Goodyear common stock and 520 shares of Goodyear preferred stock, 9998 shares of stock in the Ladysmith Smelting Corp. of Seattle, Wash.; 3214 shares of stock in the Wellman-Seaver-Morgan Co. of Akron; 1696 shares of stock in the Whitman & Barnes Co. of this city and 1270 shares of stock in the Ohio Savings & Trust Co. The mortgage also lists 2,010,000 lbs. of raw rubber stored in warehouses and said to be pledged to secure the indebtedness of the Newcastle Rubber Co. now reorganized and known as the Lehigh Tire & Rubber Co.

Liabilities of Seiberling's estate are listed at \$6,000,000. According to the agreement between Seiberling and his creditors, the creditors have agreed to extend time of payment on their claims for two years.

FORD PLANT IN FRANCE BURNS

DETROIT, Aug. 17—A message received by the Ford Motor Co. states that its plant at Issy-les-Moulineaux, a suburb of Paris, has been virtually destroyed by fire with a loss estimated at between 6,000,000 and 7,000,000 francs.